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REFRACTORIES COMPANY
PITTSBURGH, PA.
FIRE BRICK AND
REFRACTORIES

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CATALOGUE

Containing useful information in connection with the use of

SILICA, MAGNESIA CHROME AND FIRE CLAY BRICK and various REFRACTORIES

as furnished by the

HARBISON-WALKER REFRACTORIES CO

Pittsburgh — Pa.

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DAILY CAPACITY, 1,100,000 BRICK

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FIRE BRICK DEPARTMENT

GOOD material is the factor of supreme importance in all manufacturing business. During the growth and expansion of the fire brick business from small beginnings to the present output—corresponding to the growth and demands of the iron and steel industries—it has been the aim of this company to maintain the lead in supplying all demands for high grade fire brick and refractory material. To this end, all clay deposits, seemingly worthy of investigation, have been core drilled, the best experts employed and record maps placed on file, enabling the Company to open mines in the irregular formations of fire clay with exact knowledge of what will be opened. This work has been going on systematically for over thirty years. The results, with the association of a few of the most experienced and successful brick manufacturers, enable us to offer the following unrivaled list of well known brands of fire brick. Some of the brands are specially fitted for special work, as the "Benezet" for blast furnace linings. Some are similar in character to others, but owing to location of works one brand may obtain a more favorable freight rate in a given case. Correspondence or an interview will determine, according to circumstances, which is the most suitable brand to use. With a wide range of records on hand, the broadest experience in

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the business, and the good will of over seven thousand patrons to maintain, it is reasonable for customers to assume that they will get reliable advice and careful attention to orders, however large or small.

The brands included carry the world's record for output of metal per furnace lining, blast furnace stove brick that neither disintegrate nor become vitrified with the severe changes of temperature and blast that occur in furnace stoves incident to conditions connected therewith, the best of brick for cupolas, rotary cement kilns, lime kilns, open hearth steel furnaces, copper smelting, boiler settings, continuous glass furnaces and general purposes where high temperatures are in use.

The brick intended for different parts of a blast furnace lining are branded "Hearth and Bosh," "Inwall" and "Top" to prevent the mason from making mistakes. The records held by these brands are the result of careful observation over a long period, and selection from the best Pennsylvania clays. Our Ganister rock used in making "Star" Silica brick is selected from decidedly the finest deposits of this rock to be found anywhere. "Star" Silica holds the best continuous records in open hearth steel, Talbot and continuous glass furnaces.

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FIRE CLAY SHAPES IN STOCK

Shapes	Page	Brands
9" Straight	20	Benezet
	20	Hearth and Bosh Benezet
	20	Inwall Benezet
	20	Top Benezet
	20	Woodland
	20	Hearth and Bosh Woodland
	20	Inwall Woodland
	20	Top Woodland
	20	H.-W. Special
	20	Tyrone
	20	C.-Tyrone
	20	No. 2 Star
	20	Quartzite
	20	Widemire
	20	Pipe Benezet
No. 1 Key	22	Benezet
	22	Hearth and Bosh Benezet
	22	Inwall Benezet
	22	Top Benezet
	22	Woodland
	22	Hearth and Bosh Woodland
	22	Inwall Woodland
	22	Top Woodland
	22	H.-W. Special
	22	Tyrone
	22	C.-Tyrone
	22	Quartzite
No. 2 Key	22	Benezet
	22	Hearth and Bosh Benezet
	22	Top Benezet
	22	Woodland
	22	Hearth and Bosh Woodland
	22	Top Woodland
	22	H.-W. Special
	22	Tyrone
	22	C.-Tyrone
	22	Quartzite
No. 3 Key	22	Benezet
	22	Woodland
	22	C.-Tyrone
	22	Quartzite
No. 4 Key	22	Woodland
	22	Quartzite
No. 1 Arch	20	Benezet
	20	Hearth and Bosh Benezet
No. 1 Arch	20	Top Benezet
	20	Woodland
	20	Hearth and Bosh Woodland
	20	Top Woodland
	20	H.-W. Special
	20	Tyrone
	20	Quartzite
No. 2 Arch	21	Benezet
	21	Hearth and Bosh Benezet
	21	Top Benezet
	21	Woodland
	21	Hearth and Bosh Woodland
	21	Top Woodland
	21	H.-W. Special
	21	Tyrone
	21	Quartzite
No. 1 Split	21	Benezet
	21	Woodland
	21	H.-W. Special
	21	Tyrone
	21	Quartzite
No 2 Split	21	Benezet
	21	Woodland
	21	Quartzite
No. 1 Wedge	21	Benezet
	21	Woodland
	21	Tyrone
	21	H.-W. Special
	21	Quartzite
No. 2 Wedge	21	Benezet
	21	Woodland
	21	H.-W. Special
	21	Tyrone
	21	Quartzite
No. 3 Wedge	22	Benezet
	22	Woodland
	22	Quartzite
No. 1 Jamb	22	Benezet
	22	Woodland
No. 1 Circle	23	Benezet
	23	Woodland
	23	Hearth and Bosh Woodland

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FIRE CLAY SHAPES IN STOCK

CONTINUED

Shapes	Page	Brands
No. 2 Circle	23	Benezet
	23	Woodland
	23	Hearth and Bosh Woodland
No. 3 Circle	24	Woodland
	24	Hearth and Bosh Woodland
No. 4 Circle	24	Woodland
Soap	20	Benezet
	20	Woodland
	20	Tyrone
	20	Quartzite
Checker	38	Woodland
No. 3 Neck	23	Woodland
No. 2 Side Skew	22	Benezet
	22	Woodland
Large 9"	20	Benezet
	20	Woodland
Small 9"	20	Benezet
	20	Woodland
No. 1 Cupola	24	Woodland
No. 2 Cupola	24	Woodland
No. 3 Cupola	25	Woodland
No. 4 Cupola	25	Woodland
13½" Straight	32	Hearth and Bosh Benezet
	32	Inwall Benezet
	32	Top Benezet
	32	Hearth and Bosh Woodland
	32	Inwall Woodland
	32	Top Woodland
13½" No. 2 Key	32	Hearth and Bosh Benezet
	32	Inwall Benezet
	32	Top Benezet
	32	Hearth and Bosh Woodland
	32	Inwall Woodland
	32	Top Woodland
Siemens Steel Furnace Blocks	68	Woodland
Our Plan Siemens Blocks	70	Woodland
Featheredge	27	Woodland

Shapes	Page	Brands
13½" No. 4 Key	32	Hearth and Bosh Benezet
	32	Top Benezet
	32	Hearth and Bosh Woodland
	32	Top Woodland
9 x 6" Straight	33	Hearth and Bosh Benezet
	33	Inwall Benezet
	33	Top Benezet
9 x 6" Key	33	Hearth and Bosh Benezet
	33	Inwall Benezet
	33	Top Benezet
Liner Brick	35	Coke—H.-W.
Bottom Tile	35	Co. Clay
Trunnel	35	H.-W. Co. Clay
Bridge Block	25	Woodland
Stock Hole	25	Woodland
Regenerator Tile	38	Inwall Benezet
	38	Tyrone
101 Special Cover	24	Woodland
102 Special Cover	24	Woodland
Bevel Cover	36	Woodland
Square Cover	36	Woodland
Arch Cover	36	Woodland
Hearth Block	51	Hearth and Bosh Benezet
	51	Hearth and Bosh Woodland
Bung Arch	21	Woodland
No. 66	39	H.-W. Special
No. 72	39	H.-W. Special
No. 78	39	H.-W. Special
No. 84	39	H.-W. Special
No. 12	40	H.-W. Special
No. 13	40	H.-W. Special

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SILICA SHAPES IN STOCK

Shapes	Page	Brands
9" Straight	20	Star
	20	XX Sand
	20	XX Silica
Large 9"	20	Star
	20	XX Sand
	20	XX Silica
Small 9"	20	Star
	20	XX Sand
	20	XX Silica
Soap	20	Star
	20	XX Sand
	20	XX Silica
No. 1 Arch	20	Star
	20	XX Sand
	20	XX Silica
No. 2 Arch	21	Star
	21	XX Sand
	21	XX Silica
No. 3 Arch	27	Star
No. 1 Split	21	Star
	21	XX Sand
	21	XX Silica
No. 2 Split	21	Star
	21	XX Sand
	21	XX Silica
No. 1 Wedge	21	Star
	21	XX Sand
	21	XX Silica
No. 2 Wedge	21	Star
	21	XX Sand
	21	XX Silica
No. 3 Wedge	22	Star
	22	XX Sand
	22	XX Silica
Large 9" No. 1 Wedge	27	Star
Large 9" No. 2 Wedge	27	Star
No. 1 Key	22	Star
	22	XX Sand
	22	XX Silica
No. 2 Key	22	Star
	22	XX Sand
	22	XX Silica
No. 3 Key	22	Star
	22	XX Sand
	22	XX Silica
No. 4 Key	22	XX Sand
	22	XX Silica
Key Wedge	—	Star
No. 1 Jamb	22	Star
No. 2 Skew	22	Star
No. 3 Neck	23	Star
Featheredge	27	Star
12 x 6" Straight	27	Star
12" No. 1 Wedge	27	Star
12" No. 2 Wedge	28	Star
12" Soap	28	Star
12" No. 1 Wedge Soap	28	Star
12" No. 2 Wedge Soap	28	Star
12" No. 1 R. Wedge	30	Star
12" No. 1 R. Wedge Soap	30	Star
12" No. 1 Arch	28	Star
12" No. 2 Arch	28	Star
12 x 6 x 3" Straight	29	Star
12 x 9 x 3" Straight	29	Star
13½ x 4½ x 2½"	29	Star
13½" Straight	29	Star
12" No. 1 Key	30	Star
Siemens Steel Furnace Blocks	36, 37	Star
Coke Oven Crown	29	XX Silica

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MAGNESIA AND CHROME DEPARTMENT

IN this department we manufacture one brand of chrome brick specially adapted for use where chemical action destroys other brick, and two brands of magnesia brick for use in basic open hearth steel furnaces or other places where basic material is required.

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ORES USED IN MAGNESIA AND CHROME BRICK

MAGNESIA OR CALCINED MAGNESITE

OUR supplies of calcined magnesite are drawn from the best quarries known. These quarries have supplied the bulk of the calcined magnesite used in the steel trade, and the product is decidedly more uniform and satisfactory than that from any other source of supply.

For forming bottoms in open hearth steel furnaces we furnish a special calcined magnesite running low in silica.

CHROME ORE

Oxide of chromium, or, commercially, chrome ore, is the least responsive to chemical action of all refractory material obtainable at a price permitting of use in the arts. For this reason it is invaluable where chemical action prevents the use of ordinary material. The ore is used by many for special purposes. After experimenting with practically all of the known deposits of chrome ore in this country and abroad, we have adopted exclusively for our use and for the wants of our trade, two qualities which we consider superior to anything on the market. These are as follows :

First—"Special" low silica ore, which we recommend for practically everything in connection with basic open hearth steel practice.

Second—Fifty per cent. ore, which we recommend for chemical manufacturers and other special work.

Consumers will be supplied with the above ores, either ground or in lump form, on short notice.

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MAGNESIA BRICK

THE material used in magnesia brick is watched carefully, the analysis being kept at a point that insures the highest standard as to refractoriness, and the ingredients are combined so that the brick excel in physical properties.

"Magnesia" are made from carefully selected calcined magnesite, of a quality that has been found most satisfactory and uniformly reliable for all work connected with steel manufacturing.

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CHROME BRICK

CHROME BRICK are used as a neutral course to separate the fire clay brick used in lower courses of open hearth steel furnace hearths from the magnesite brick used for the inner and upper courses. Also for paving floors of gas ports as far from hearth as slag is liable to splash onto silica brick, and for quick repairs while furnace is at working heat, being specially suited for the latter purpose, as they are not affected by sudden changes of temperature. A few courses of chrome brick will be found useful in lower portions of soaking pits, or wherever slag or cinder is apt to cut out ordinary fire brick.

In copper furnaces chrome brick are used with marked success for lining the bosh of the furnace from the tuyere line down, also for lining the settlers. In both cases the scouring and chemical action that occurs with the slag and matte acting on clay brick does not occur with chrome brick.

In the side walls of matte and refining reverberatory copper furnaces chrome brick will last from four to six times as long as clay or silica brick.

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MAGNESIA SHAPES IN STOCK

Shapes	Page of Illustrat'n	
Straight, Standard Size	44	Magnesia
No. 1 Arch, Standard Size	44	Magnesia
No. 2 Arch, Standard Size	44	Magnesia
No. 1 Wedge, Standard Size	—	Magnesia
No. 2 Wedge, Standard Size	44	Magnesia
Soap, Standard Size	44	Magnesia
Split, Standard Size	44	Magnesia
No. 1 Key, Standard Size	44	Magnesia
No. 2 Key, Standard Size	—	Magnesia

CHROME SHAPES IN STOCK

Shapes	Page of Illustrat'n	
Straight, 9-inch	45	Chrome
No. 1 Wedge, 9-inch	45	Chrome
No. 2 Wedge, 9-inch	45	Chrome
No. 1 Key	45	Chrome
No. 2 Key	45	Chrome

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REESE CLAY AND SILICA BRICK WORKS

THE Isaac Reese & Sons Company have been favorably known to the consumers of fire brick for a long period. The brands shown in table are made from high grade material, and are well suited for general mill work, pottery kilns, etc. The Reese brand of Silica brick has an enviable reputation for both open-hearth steel and continuous glass tank furnaces, backed up by some remarkable records.

The table on following page shows the shapes and brands made, with page of illustration.

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REESE FIRE CLAY BRICK

Shapes	Page	Brands
9-inch Straight .	20	Phoenix
	20	Valley
	20	Wallace
	20	W. F. B.
Large 9-inch	20	Phoenix
	20	Wallace
Small 9-inch.....	20	Phoenix
	20	Wallace
Soap.....	20	Phoenix
	20	Wallace
	20	W. F. B.
Checker.....	38	Phoenix
No. 1 Arch.....	20	Phoenix
	20	Valley
	20	Wallace
	20	W. F. B.
No. 2 Arch	21	Phoenix
	21	Valley
	21	Wallace
	21	W. F. B.
No. 1 Split	21	Phoenix
	21	Wallace
	21	W. F. B.
No. 2 Split	21	Phoenix
	21	Wallace
No. 1 Wedge....	21	Phoenix
	21	Valley
	21	Wallace
	21	W. F. B.
No. 2 Wedge....	21	Phoenix
	21	Valley
	21	Wallace
	21	W. F. B.

Shapes	Page	Brands
No. 3 Wedge.....	22	Phoenix
	22	Wallace
No. 1 Key	22	Phoenix
	22	Wallace
	22	W. F. B.
No. 2 Key	22	Phoenix
	22	Wallace
	22	W. F. B.
No. 3 Key	22	Phoenix
	22	Wallace
No. 4 Key	22	Phoenix
	22	Wallace
No. 1 Jamb.....	22	Phoenix
	22	Wallace
No. 2 Side Skew..	22	Phoenix
	22	Wallace
Featheredge	27	Phoenix
No. 2 Neck.....	23	Phoenix
	23	Wallace
No. 3 Neck	23	Phoenix
	23	Wallace
Stock Hole	25	Phoenix
Boiler Tile		
12 x 12 x 2 inch..	26	
15 x 12 x 2 inch.	26	
18 x 12 x 2 inch..	26	
Other sizes made to order		

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SILICA BRICK

Shapes	Page	Brands
9-inch Straight ...	20	Reese
	20	Basic
Large 9-inch.....	20	Reese
	20	Basic
Small 9-inch	20	Reese
	20	Basic
Soap	20	Reese
	20	Basic
No. 1 Arch	20	Reese
	20	Basic
No. 2 Arch	21	Reese
	21	Basic
No. 1 Split	21	Reese
	21	Basic
No. 2 Split	21	Reese
	21	Basic
No. 1 Wedge.....	21	Reese
	21	Basic
No. 2 Wedge.....	21	Reese
	21	Basic
No. 3 Wedge.....	22	Reese
	22	Basic
Large 9-inch.....	27	Reese
No. 1 Wedge ...	27	Basic
Large 9-inch.....	27	Reese
No. 2 Wedge....	27	Basic
No. 1 Key	22	Reese
	22	Basic
No. 2 Key.....	22	Reese
	22	Basic
No. 3 Key.....	22	Reese
	22	Basic

Shapes	Page	Brands
No. 1 Jamb.....	22	Basic
No. 2 Skew.....	22	Reese
	22	Basic
No. 3 Neck.....	23	Reese
	23	Basic
Featheredge	27	Reese
	27	Basic
Large 9-inch Featheredge...	—	Reese
12 x 6 x 3-inch Straight.....	29	Reese
12-inch No. 1 R. Wedge	30	Reese
12-inch No. 2 R. Wedge	30	Reese
12 x 9 x 3-inch Large Soap.....	29	Reese
12 x 3 x 3-inch Small Soap.....	30	Reese
12-inch No. 1 R. Large Wedge Soap.....	30	Reese
12-inch No. 2 R. Large Wedge Soap.....	30	Reese
12-inch No. 1 Arch	28	Reese
12-inch No. 1 Key	30	Reese
12-inch No. 2 Key.	30	Reese

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CLEARFIELD FIRE BRICK WORKS

THE trade of the Clearfield Fire Brick Company (Ltd.) extends over a wide territory and the brands of brick made are favorably known for steel purposes, malleable iron works, blast furnaces, puddling furnaces, lime kilns, for general mill purposes and other places where brick made from high grade clay are required. The clays used are all selected flint clays.

On following page is a list of brands and shapes made, giving page of illustration.

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CLEARFIELD FIRE BRICK WORKS

Shapes	Page	Brands
9" Straight	20	Clearfield
	20	Clearfield S
	20	Hearth and Bosh Clearfield
	20	Inwall Clearfield
	20	Top Clearfield
Large 9"	20	Clearfield S
Small 9"	20	Clearfield S
Soap	20	Clearfield S
Checker	38	Clearfield S
No. 1 Arch	20	Clearfield S
	20	Hearth and Bosh Clearfield
	20	Top Clearfield
No. 2 Arch	21	Clearfield S
	21	Hearth and Bosh Clearfield
	21	Top Clearfield
No. 1 Split	21	Clearfield S
No. 2 Split	21	Clearfield S
No. 1 Wedge	21	Clearfield S
No. 2 Wedge	21	Clearfield S
No. 3 Wedge	22	Clearfield S
No. 1 Key	22	Clearfield S
	22	Hearth and Bosh
	22	Inwall Clearfield
	22	Top Clearfield
No. 2 Key	22	Clearfield S
	22	Hearth and Bosh Clearfield
	22	Top Clearfield
No. 3 Key	22	Clearfield S
No. 4 Key	22	Clearfield S
No. 1 Circle	23	Clearfield S
No. 2 Circle	23	Clearfield S
No. 1 End Skew	23	Clearfield S
No. 2 Side Skew	22	Clearfield S
No. 3 Edge Skew	23	Clearfield S
No. 1 Neck	23	Clearfield S
No. 2 Neck	23	Clearfield S
No. 3 Neck	23	Clearfield S
No. 1 Jamb	22	Clearfield S
No. 2 Jamb	—	Clearfield S
No. 3 Jamb	—	Clearfield S
Featheredge	27	Clearfield S
13½" Straight	32	Hearth and Bosh Clearfield
	32	Inwall Clearfield
	32	Top Clearfield
13½" No. 2 Key	32	Hearth and Bosh Clearfield
	32	Inwall Clearfield
	32	Top Clearfield
13½" No. 4 Key	32	Hearth and Bosh Clearfield
	32	Top Clearfield
Velvetry Tile	26	Clearfield S

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PHILIPSBURG FIRE BRICK WORKS

The Philipsburg Fire Brick Works make the following brands from choice Clearfield County flint clays :

"WIGTON STEEL" is specially recognized as good for pottery kilns, general mill work, etc.

"HEARTH AND BOSH WIGTON," "INWALL WIGTON," "TOP WIGTON" are specially made for blast furnace linings.

FIRE CLAY BRICK

Shapes	Page	Brands
9" Straight	20	Wigton Steel
	20	Hearth and Bosh Wigton
	20	Inwall Wigton
	20	Top Wigton
Large 9"	20	Wigton Steel
Small 9"	20	Wigton Steel
Soap	20	Wigton Steel
No. 1 Arch	20	Wigton Steel
No. 2 Arch	21	Wigton Steel
No. 1 Split	21	Wigton Steel
No. 2 Split	21	Wigton Steel
No. 1 Wedge	21	Wigton Steel
No. 2 Wedge	21	Wigton Steel
No. 3 Wedge	22	Wigton Steel
No. 1 Key	22	Wigton Steel
	22	Hearth and Bosh Wigton
	22	Inwall Wigton
	22	Top Wigton
No. 2 Key	22	Wigton Steel
	22	Hearth and Bosh Wigton
	22	Top Wigton
No. 3 Key	22	Wigton Steel
No. 4 Key	22	Wigton Steel
No. 1 Jamb	22	Wigton Steel
No. 2 Side Skew	22	Wigton Steel
No. 2 Neck	23	Wigton Steel
No. 3 Neck	23	Wigton Steel
12 x 12 x 2"	26	Wigton Steel
15 x 12 x 2"	26	Wigton Steel
18 x 12 x 2"	26	Wigton Steel
Bung Arch	21	Wigton Steel
Featheredge	27	Wigton Steel
Flatback Arch	26	Wigton Steel
Flatback Straight	26	Wigton Steel
13½" Straight	32	Hearth and Bosh Wigton
	32	Inwall Wigton
	32	Top Wigton
13½" No. 2 Key	32	Hearth and Bosh Wigton
	32	Inwall Wigton
	32	Top Wigton
13½" No. 4 Key	32	Hearth and Bosh Wigton
	32	Top Wigton
13½ x 4½ x 2½" Straights	29	Wigton Steel

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TABLE OF SHAPES

MADE AT CLINTON COUNTY WORKS

With Page of Illustration

Shapes	Page	Brands
9-inch Straight ...	20	Munro
	20	Eureka
	20	Clinton
Large 9-inch.....	20	Munro
	20	Eureka
Small 9-inch	20	Munro
	20	Eureka
Soap.....	20	Munro
	20	Eureka
	20	Clinton
No. 1 Arch.....	20	Munro
	20	Eureka
	20	Clinton
No. 2 Arch.....	21	Munro
	21	Eureka
	21	Clinton
No. 1 Split	21	Munro
	21	Eureka
	21	Clinton
No. 2 Split	21	Munro
	21	Eureka
	21	Clinton
No. 1 Wedge.....	21	Munro
	21	Eureka
	21	Clinton
No. 2 Wedge.....	21	Munro
	21	Eureka
	21	Clinton
No. 3 Wedge.....	22	Munro
Bung Arch.....	21	Munro
Featheredge.....	27	Munro
No. 1 Key.....	22	Munro
	22	Eureka
	22	Clinton
No. 2 Key.....	22	Munro
	22	Eureka
	22	Clinton
No. 3 Key.....	22	Munro
	22	Eureka
No. 4 Key.....	22	Munro
No. 1 Jamb.....	22	Munro
No. 2 Side Skew	22	Munro
No. 3 Neck.....	23	Munro
No. 1 Circle.....	23	Munro
No. 2 Circle.....	23	Munro
No. 3 Circle.....	24	Munro
No. 4 Circle.....	24	Munro
No. 1 Cupola.....	24	Munro
No. 2 Cupola.....	24	Munro
No. 3 Cupola.....	25	Munro
No. 4 Cupola.....	25	Munro
Stock Hole	25	Munro
Boiler Tile	26	12 x 12 x 2"
	26	15 x 12 x 2"
	26	18 x 12 x 2"
Rotary Kiln Shapes:		
No. 66.....	39	Alusil
No. 72.....	39	Alusil
No 78.....	39	Alusil
No. 84.....	39	Alusil
No. 17.....	40	Alusil

Digitized by Google

SHAPES IN STOCK

9-INCH STRAIGHT

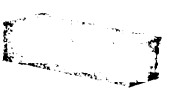
9 x 4½ x 2½"

LARGE 9-INCH

9 x 6¾ x 2½"

SMALL 9-INCH

9 x 3½ x 2½"



SOAP

9 x 2¼ x 2½"

CHECKER

9 x 2¾ x 2¾"

No. 1 ARCH

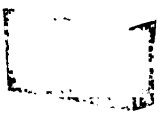
72 Brick to the Circle

4' Inside Diameter

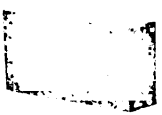
9 x 4½ x 2½ x 2⅛"

Digitized by Google

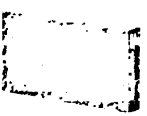
SHAPES IN STOCK



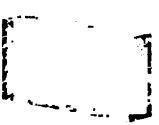
NO. 2 ARCH
42 Brick to the Circle
2′ Inside Diameter
9 x 4½ x 2½ x 1¾″



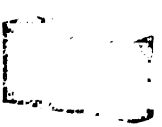
BUNG ARCH
9 x 4½ x 2½ x 2⅜″



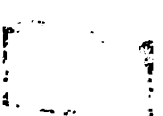
NO. 1 SPLIT
9 x 4½ x 1¼″



NO. 2 SPLIT
9 x 4½ x 2″



NO. 1 WEDGE
102 Brick to the Circle
5′ Inside, 6′ 6″ Outside Diam.
9 x 4½ x 2½ x 1⅞″



NO. 2 WEDGE
68 Brick to the Circle
2′ 6″ Inside, 4″ Outside Diam.
9 x 4½ x 2½ x 1½″

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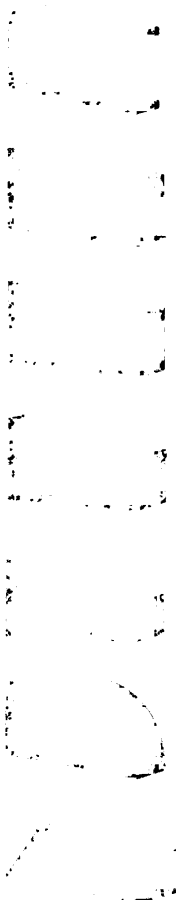
SHAPES IN STOCK



NO. 3 WEDGE
56 Brick to the Circle
3′ Inside, 4′ 6″ Outside Diam.
9 x 4½ x 3 x 2″

NO. 1 KEY
112 Brick to the Circle
12′ Inside, 13′ 6″ Outside Diam.
9 x 4½ x 4 x 2½″

NO. 2 KEY
65 Brick to the Circle
6′ Inside, 7′ 6″ Outside Diam.
9 x 4½ x 3½ x 2½″

NO. 3 KEY
41 Brick to the Circle
3′ Inside, 4′ 6″ Outside Diam.
9 x 4½ x 3 x 2½″

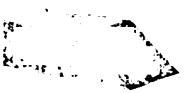
NO. 4 KEY
26 Brick to the Circle
1′ 6″ Inside, 3′ Outside Diam.
9 x 4½ x 2¼ x 2½″

NO. 1 JAMB
9 x 4½ x 2½″

NO. 2 SIDE SKEW
9 x 4½ x 2½ x 1¾″

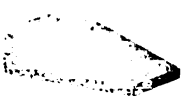
Digitized by Google

SHAPES IN STOCK

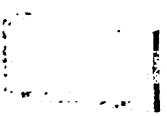


NO. 1 END SKEW
9 x 6⅛ x 4½ x 2½"

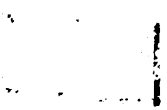
NO. 3 EDGE SKEW NECK
9 x 4½ x 2¼ x 2½"



NO. 1 NECK
9 x 4½ x 3½ x 2½"



NO. 2 NECK
9 x 4½ x 2½ x 1½ x ⅝"



NO. 3 NECK OR POINT
9 x 4½ x 2½ x ⅝"

NO. 1 OR 33-INCH CIRCLE BRICK
12 Brick to the Circle
24" Inside, 33" Outside Diam.
9 x 6½ x 4½ x 2½"

NO. 2 OR 45-INCH CIRCLE BRICK
14 Brick to the Circle
36" Inside, 45" Outside Diam.
9 x 7 3/16 x 4½ x 2½"

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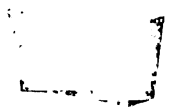
SHAPES IN STOCK

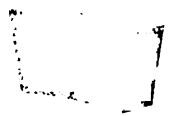


NO. 3 OR 51-INCH CIRCLE BRICK

18 Brick to the Circle

42" Inside, 51" Outside Diam.

$9 \times 7\frac{7}{16} \times 4\frac{1}{2} \times 2\frac{1}{2}$"



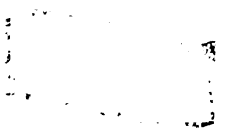
NO. 4 OR 78-INCH CIRCLE BRICK

31 Brick to the Circle

78" Inside, 87" Outside Diam.

(For Cahall Boilers)

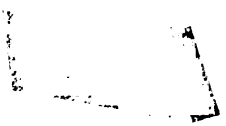
$9 \times 8\frac{1}{16} \times 4\frac{1}{2} \times 2\frac{1}{2}$"



NO. 101 SPECIAL COVER

Used in Malleable Furnaces

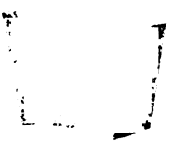
$13 \times 4\frac{1}{2} \times 2\frac{1}{2}$"



NO. 102 SPECIAL COVER

Used in Malleable Furnaces

$12\frac{1}{4} \times 11\frac{3}{8} \times 4\frac{1}{2} \times 2\frac{1}{2}$"



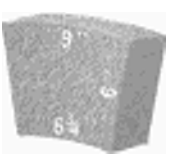
NO. 1 CUPOLA BRICK

15 Brick to the Circle

30" Inside, 42" Outside Diam.

$9 \times 6\frac{7}{16} \times 6 \times 3$"

$9 \times 6\frac{7}{16} \times 6 \times 4$"



NO. 2 CUPOLA BRICK

17 Brick to the Circle

36" Inside, 48" Outside Diam.

$9 \times 6\frac{3}{4} \times 6 \times 3$"

$9 \times 6\frac{3}{4} \times 6 \times 4$"

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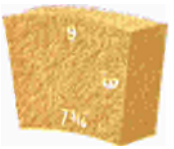
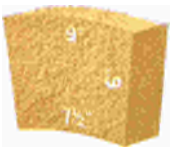
SHAPES IN STOCK



No. 3
CUPOLA BRICK
21 Brick to the Circle
48" Inside
60" Outside Diameter
9 x $7\frac{3}{16}$ x 6 x 3"
9 x $7\frac{3}{16}$ x 6 x 4"



No. 4
CUPOLA BRICK
25 Brick to the Circle
60" Inside
72" Outside Diameter
9 x 7½ x 6 x 3"
9 x 7½ x 6 x 4"

STOCK HOLE TILE
18 x 9 x 4"

BRIDGE BLOCK
13 x 6½ x 3"

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SHAPES IN STOCK

VELVETRY TILE

25 x 10 x 7 x 4 x 4½
16 x 4½"

POTTERY KILN TILE

FLATBACK

9 x 6 x 2½"

FLATBACK ARCH

9 x 6 x 3½ x 2½"

BOILER TILE

12 x 12 x 2"
15 x 12 x 2"
18 x 12 x 2"

Regular boiler tile carried in stock.

Special tile for any type of boiler made on request.

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SHAPES IN STOCK

NO. 3 ARCH
9 x 4½ x 2½ x 1"

FEATHER EDGE
9 x 4½ x 2½ x ⅛"

LARGE 9-INCH No. 1 WEDGE
9 x 6¾ x 2½ x 1⅞"

LARGE 9-INCH No. 2 WEDGE
9 x 6¼ x 2½ x 1½"

12-INCH STRAIGHT
12 x 6 x 2½"

12-INCH No. 1 WEDGE
12 x 6 x 2$\frac{1}{16}$ x 2½"

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SILICA SHAPES

12-INCH No. 2 WEDGE
181 Brick to the Circle
12′ Inside Diameter
12 x 6 x 2⅞ x 2½"

12-INCH SOAP
12 x 9 x 2½"

12-INCH No. 1 WEDGE SOAP
12 x 9 x 2 1/16 x 2½"

12-INCH No. 2 WEDGE SOAP
12 x 9 x 2⅞ x 2½"

12-INCH No. 1 ARCH
75 Brick to the Circle
5′ Inside, 6′ Outside Diam.
12 x 6 x 3 x 2½"

12-INCH No. 2 ARCH
75 Brick to the Circle
4′ Inside, 5′ Outside Diam.
12 x 6 x 2½ x 2"

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SILICA SHAPES

12x6x3 INCH STRAIGHT

12x9x3 INCH STRAIGHT SOAP

13½-INCH BINDER BRICK
13½ x 4½ x 2½"

13½-INCH STRAIGHT
13½ x 6 x 2½"

COKE OVEN CROWN BRICK
9 x 4½ x 4 x 2½ x $2\frac{3}{16}$"

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SILICA SHAPES

12 x 3 INCH SOAP
12 x 3 x 3"

12 x 9 INCH No. 1 R. SOAP WEDGE
12 x 9 x 3 x 2½"

12 x 9 INCH No. 2 R. SOAP WEDGE
12 x 9 x 3 x 2"

12-INCH No. 1 R. WEDGE
12 x 6 x 3 x 2½"

12-INCH No. 2 R. WEDGE
12 x 6 x 3 x 2"

12-INCH No. 1 KEY
12 x 6 x 5½ x 3"

12-INCH No. 2 KEY
12 x 6 x 5 x 3"

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RECUPERATOR FLUE BRICK

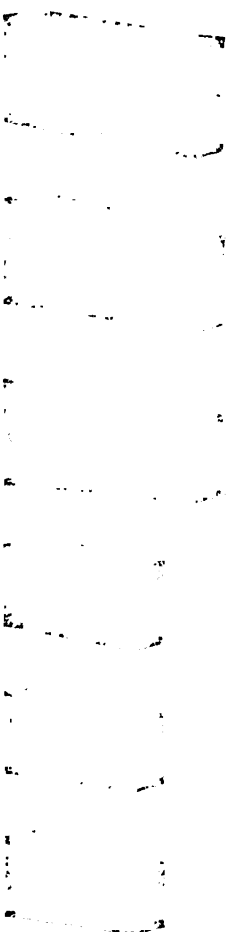
Shapes similar to the above cut are largely used in various kinds of gas, melting and heating furnaces and recuperators, where a high grade of brick is required.

We are well equipped for doing such work, and where a large quantity are needed can get them out in the best possible shape and at a reasonable cost.

Digitized by Google

SHAPES IN STOCK

BLAST FURNACE LINING BRICK



13½-INCH STRAIGHT
13½ x 6 x 2½"

13½-INCH No. 2 KEY
90 Brick to the Circle
12' Inside Diameter
13½ x 6 x 5 x 2½"

13½-INCH No. 4 KEY
52 Brick to the Circle
6' Inside Diameter
13½ x 6 x 4⅜ x 2½"

9-INCH STRAIGHT
9 x 4½ x 2½"

9-INCH No. 1 KEY
112 Brick to the Circle
12' Inside Diameter
9 x 4½ x 4 x 2½"

9-INCH No. 2 KEY
65 Brick to the Circle
6' Inside Diameter
9 x 4½ x 3½ x 2½"

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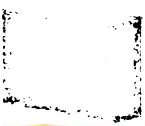
SHAPES IN STOCK

BLAST FURNACE LINING BRICK



9 x 6 INCH KEY
For 12′ Circle
85 Brick to the Circle
9 x 6 x 5⅜ x 2½"

9 x 6 INCH STRAIGHT
For enlarging above circles
9 x 6 x 2½"

BLAST FURNACE ARCH BRICK FOR GAS FLUES

13½ x 9 INCH ARCH
For 3, 4, 5′ Inside Diameter
13½ x 9 x 3½ x 2¼"

13½ x 9 INCH STRAIGHT
For enlarging above circles
13½ x 9 x 3½"

9 x 9 INCH ARCH
For 3, 4, 5′ Inside Diameter
9 x 9 x 3½ x 2¼"

9 x 9 INCH STRAIGHT
For enlarging above circles
9 x 9 x 3½"

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HEXAGON STOVE SHAPES

12x13 INCH HEXAGON

9" Diameter Flue

12 x 7¼ x 9"

6x13 INCH HEXAGON

For Breaking Joints

6 x 7¼ x 9"

6x13 INCH HEXAGON

For Finishing Top

6 x 7¼ x 9"

Typical of many shapes made—shapes for special stoves shown with cuts of stoves. See index.

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COKE OVEN BRICK AND TILE

H.-W.
CROWN BRICK
9 x 4½ x 4 x 2½ x $2\frac{3}{16}$

H.W.
LINER BRICK
9 x 4½ x 4 x 2½"

BOTTOM TILE
No. 14
12 x 12 x 3"

TRUNNELL HEAD
No. 42
23 x 21 x 10 x 13 x 14"

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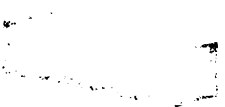
SIEMENS STEEL FURNACE BLOCKS
IN WOODLAND BRAND AND SILICA

SIEMENS STEEL FURNACE COVER BRICK
MADE IN FIRE CLAY ONLY

BEVEL COVER
12 x 4 x 3¼ x 3"



SQUARE COVER
12 x 4 x 3"

ARCH COVER
12 x 4 x 3 x 2½"

SPECIAL COVER
12 x 4½ x 3 x 2½"

NO. 2
11 x 4½ x 2½ x ⅜"

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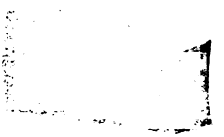
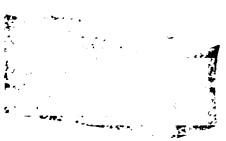
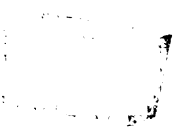
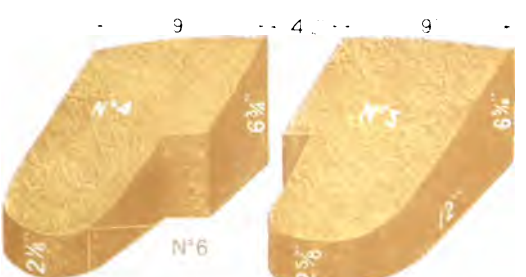
SIEMENS STEEL FURNACE BLOCKS

IN WOODLAND BRAND AND SILICA









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SIEMENS REGENERATOR TILE AND BRICK

The following sizes are kept in stock:

16 x 6 x 3	21 x 6 x 3	24 x 9 x 3
18 x 6 x 3	22 x 6 x 3	26 x 9 x 3
20 x 6 x 3	24 x 6 x 3	

All other sizes made to order.

REGENERATOR OR CHECKER BRICK

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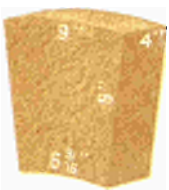
SHAPES FOR ROTARY KILNS

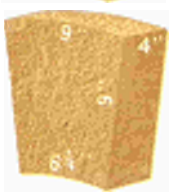
9-INCH
ROTARY KILN BLOCKS
No. 60

21 Brick to the Circle
60" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
9 x 9 x $6\frac{5}{16}$ x 4"



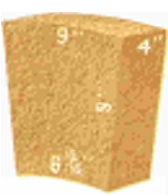
No. 66

23 Brick to the Circle
66" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
9 x 9 x $6\frac{9}{16}$ x 4"



No. 72

26 Brick to the Circle
72" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
9 x 9 x $6\frac{3}{4}$ x 4"



No. 78

28 Brick to the Circle
78" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
9 x 9 x $6\frac{15}{16}$ x 4"

No. 84

30 Brick to the Circle
84" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
9 x 9 x $7\frac{1}{16}$ x 4"

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SHAPES FOR ROTARY KILNS

No. 12
60" Outside Diameter
21 to a Circle
H.-W. Special Aluminous Alusil

No. 13
72" Outside Diameter
25 to a Circle
H.-W. Special Aluminous Alusil

No. 14
84" Outside Diameter
30 to a Circle
H.-W. Special Aluminous Alusil

No. 15
84" Outside Diameter
22 to a Circle
H.-W. Special Aluminous Alusil

No. 16
84" Outside Diameter
30 to a Circle
H.-W. Special Aluminous Alusil

No. 17
84" Outside Diameter
22 to a Circle
H.-W. Special Aluminous Alusil

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SHAPES FOR ROTARY KILNS

NO. 18
FEED END BLOCK
72" Outside Diameter
25 to a Circle
C. Tyrone
C. Eureka

NO. 19
DISCHARGE END BLOCK
84" Outside Diameter
29 to a Circle
H.-W. Special Aluminous
Alusil

NO. 20
CEMENT KILN SHAPE
32" Inside Diameter
29 to a Circle

NO. 21
CEMENT KILN SHAPE
5′ 4" Inside Diameter
51 to a Circle

NO. 22
CEMENT KILN SHAPE
8′ 0" Inside Diameter
76 to a Circle

Any shapes desired will be made to order

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TYPICAL LOCOMOTIVE FIRE BRICK

All types of locomotive tile made to order

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SHAPES FOR CONVERTER BOTTOMS

TUYERE FOR CONVERTER BOTTOM

Tuyeres of all types and dimensions made to order

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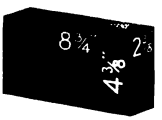
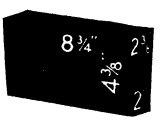
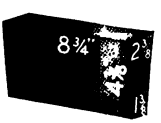
MAGNESIA SHAPES IN STOCK



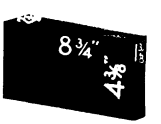
STRAIGHT, STANDARD SIZE
MAGNESIA
8¼ x 4⅛ x 2⅛"



NO. 1 ARCH, STANDARD SIZE
86 Brick to the Circle
58" Inside Diameter
MAGNESIA
8¼ x 4⅛ x 2⅛ x 2"



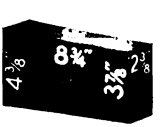
NO. 2 ARCH, STANDARD SIZE
54 Brick to the Circle
30" Inside Diameter
MAGNESIA
8¼ x 4⅜ x 2⅜ x 1⅜"



NO. 2 WEDGE, STANDARD SIZE
57 Brick to the Circle
2' 3" Inside Diameter
MAGNESIA
8¼ x 4⅜ x 2⅜ x 1⅜"

SOAP, STANDARD SIZE
MAGNESIA
8¼ x 2 3/16 x 2⅛"

SPLIT, STANDARD SIZE
MAGNESIA
8¼ x 4⅜ x 1 3/16"



NO. 1 KEY, STANDARD SIZE
107 Brick to the Circle
10' 8" Inside Diameter
MAGNESIA
8¼ x 4⅛ x 3⅞ x 2⅜"

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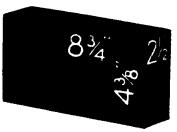
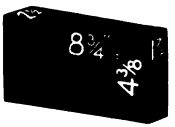
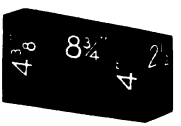
CHROME SHAPES IN STOCK



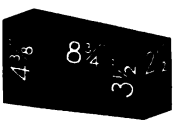
9-INCH STRAIGHT
CHROME
8¼ x 4⅜ x 2½"



9-INCH No. 1 WEDGE
CHROME
8¾ x 4⅜ x 2½ x 1⅞"



No. 1 KEY
CHROME
8¾ x 4⅜ x 4 x 2½"



No. 2 KEY
CHROME
8¼ x 4⅜ x 3½ x 2½"

THE above are the only shapes carried in stock for the reason that the shapes shown will generally answer all purposes for which chrome brick are required. Other shapes will be made to order.

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BLAST FURNACE LININGS

BLAST furnace linings have been furnished for many small furnaces running on high fuel consumption and high top heats where magnetite and foreign hæmatite ores are used, Cornwall ores and zinc residium ores; also furnaces using fuel high in sulphur, and others using by-product coke, all with good results.

We have been making blast furnace linings for the last thirty-five years, and have made more than 90 per cent. of all the linings used in the United States. Our linings have been used under every imaginable condition, under hundreds of different managers, in all types of furnaces, and with all classes of ore and fuel. The uniformly good results prove that reliable brick were furnished. The results from a blast furnace lining are too important to depend on a hit or a miss lining.

The importance of calling workmen's attention constantly, while placing the lining, to the fact that the brick are made for a certain part of the furnace, has led to our branding on the brick, plainly, that part of the furnace for which the brick are made, viz., "HEARTH AND BOSH," "INWALL," "TOP."

In order to get uniformly satisfactory results about a furnace, it is of great importance that the brick used for lining downcomers and flues be able to resist the cutting action of strong blasts charged with ore dust and the cutting

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BLAST FURNACE LININGS—CONTINUED

particles of coke that usually come from a blast furnace. "BENEZET PIPE" and "WOODLAND PIPE" brick are made specially for this purpose and give good results.

The present blast furnace practice—closed top furnaces, high-pressure hot blasts, etc., makes it more essential than ever before that the lining be the best obtainable. At an early period, and continuously to the present time, this branch of our business has received special attention, resulting in tonnage of metal per lining not thought of as possible previous to the records we have recently obtained. The cut on page 50 shows the method of building or breaking joints with 9-inch and 13½-inch brick in the construction of furnace lining wall.

BOTTOM BLOCKS

THE cuts on page 51 show our present method of constructing bottoms and the method of breaking joints. The blocks are all alike; having parallel sides and being made under heavy pressure, they are close in bond and true to shape. This enables the mason to make a closer bottom with less trouble than could be done with the blocks formerly made on radial lines.

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SOME RECORD RUNS "BENEZET" AND "WOODLAND" LININGS

PITTSBURGH DISTRICT AND VALLEYS

Size of Furnace	Product and	Tonnage	Period in Blast	Lining
22 x 100		1,287,381	.....	Benezet
22 x 100		1,097,314	.....	Benezet
22 x 100		1,184,382	.....	Benezet
22 x 100		950,774	.....	Benezet
20 x 80	Bessemer,	1,296,192	.....	Benezet
	Bessemer,	858,159	.....	Benezet
	Spiegel,	18,065	.....	Benezet
	Ferro,	19,635	.....	Benezet
		895,860		
20 x 90	Bessemer,	942,365	.....	Benezet
20 x 90	Bessemer,	870,255	.....	Benezet
20 x 90	Bessemer,	635,741	.....	Benezet
20 x 80	Bessemer,	632,669	.....	Benezet
20 x 80	Bessemer,	608,108	.....	Benezet
20 x 80	Bessemer,	580,060	.....	Benezet
20 x 80	Bessemer,	793,892	.....	Benezet
20 x 80		600,957	.....	Benezet
20 x 80		596,491	.....	Benezet
20 x 80	Mill iron,	380,000		
	Bessemer,	117,000		
	Spiegel,	25,000		
		522,000	6 yrs. 1 mo.	Benezet
20 x 80	Bess'r and Mill	550,000	6 yrs. 1 mo.	Benezet
18 x 78		327,000	5 yrs. 7 mos.	Benezet
23 x 105⅔		572,000	3 yrs. 3 mos.	
		565,000	3 yrs. 4 mos.	
20 x 80	Bessemer,	520,356	.....	Woodland
20 x 80	Bess'r, 322,617			
	Ferro, 5,025			
	Spiegel, 36,503			
	Sil. 688	364,834	.....	Woodland

OTHER DISTRICTS

18 x 74	Foundry,	152,462	3 yrs.	Woodland
16 x 76' 10"	Foundry,	235,000	4 yrs. 3½ mos	Woodland
13 x 65	F'dry & Bess'r	115,500	*3 to Aug., '05	Woodland
16 x 63' 10"	Foundry,	202,354	3 yrs. 10 mos.	Woodland
15 x 66' 9"	Foundry,	196,392	5 yrs. 3 mos.	Woodland
16 x 63' 10"	F'dry & Bess'r	306,290	5 yrs. 3 mos.	
17 x 88'		275,000	3 yrs. 6 mos.	
18'6" x 91'	Bess'r, over	700,000	4 yrs. 6 mos.	

Thirty-six (36) of our best records show a production of 19,493,390 tons, or an average of 541,483 tons per lining.

* August, 1905, still running in good shape.

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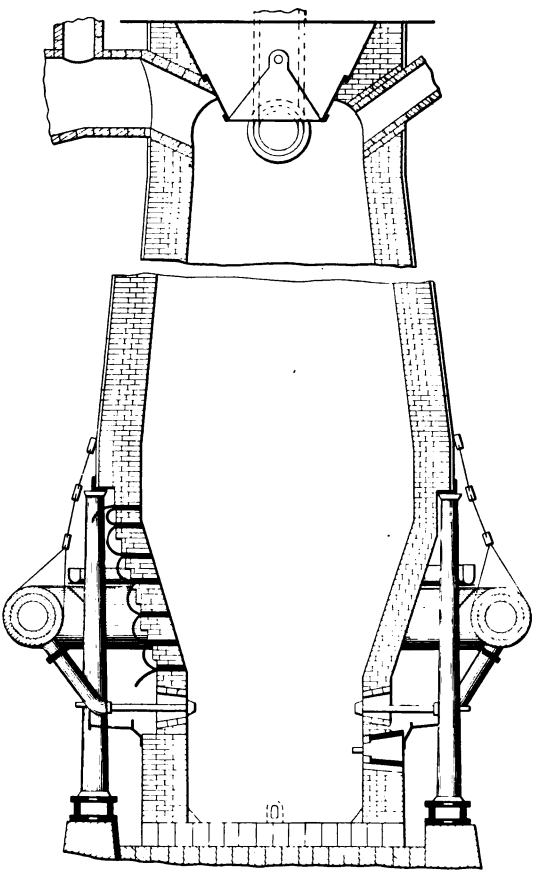
TYPICAL BLAST FURNACE

Showing Method of Breaking Joints with Lining of 13½ and 9" Brick



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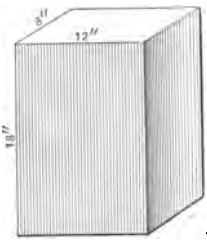
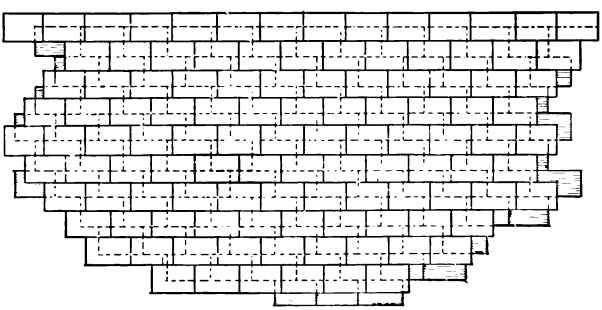
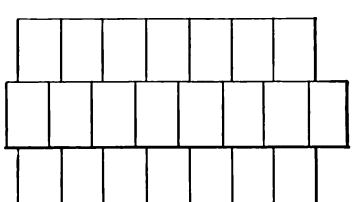
FURNACE HEARTH BLOCK







Above cuts show method of setting blocks and breaking joints in construction of furnace hearth.

Bottom blocks referred to on page 48.

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BLAST FURNACE STOVE BRICK

BLAST furnace stove brick are only second in importance to the furnace lining, for the reason that it is not as costly to cut a stove out for repairs as to shut down a furnace for a new lining; but, owing to the heavy burden carried and the disintegrating tendency of hot gases constantly varying in temperature, the difficulties to contend with in making a good stove brick are equal, though different, to those met with in making a good lining.

The essential qualities in blast furnace stove brick are, capacity to absorb heat readily from the combustion of waste furnace gases, readiness to give off this heat rapidly to the air that is blown into the furnace, and strength of bond between the particles of fire clay to resist the disintegrating action of the hot gases. In addition to strength of bond necessary to resist action of hot gases, it is essential that the iron which is in all fire clay should be converted into a silicate of iron, which is a fixed form that is not acted upon by furnace gases. This can only be done by making the brick of high grade fire clay that will stand a temperature of 2,500 degrees Fahrenheit or upwards in burning the fire brick without vitrifying the clay in same. In service, although stove brick are not subjected to the intense heat applied to a blast furnace bosh, the weight carried and long continued heat are apt to cause a gradual fusing and solidifying of the brick, unless high grade clay with a liberal margin of refractoriness is

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used in making the brick. If brick are made of sufficiently refractory clay but not well bonded, or made by any modification of the dry process, and not burned by the high temperature above referred to, in order to convert the iron into a silicate, they are apt to disintegrate within a few months after starting the furnace. At the temperatures produced by the combustion of furnace gases in stoves, low grade brick are apt to squeeze and let down the lining, also to become vitrified.

Glazed or vitrified substances will neither absorb nor give off heat as rapidly as porous or rough material.

Through lack of attention to the above requirements, we have been called upon several times to replace stove linings in less than one year from date of construction. Records and non-vitrified bats from old stove linings show that our stove lining brick are perfectly adapted to the service required.

In connection with illustration of typical stoves in use, a cut of the special shape used in each of several types is shown; these, and all similar shapes for stoves, are made from good clay, burned at a high temperature to insure all iron in the clay being converted into the silicate form in order to enable the brick to resist the oxidizing or disintegrating action of the hot gases.

For cuts of stoves in general use, see pages 54 to 63.

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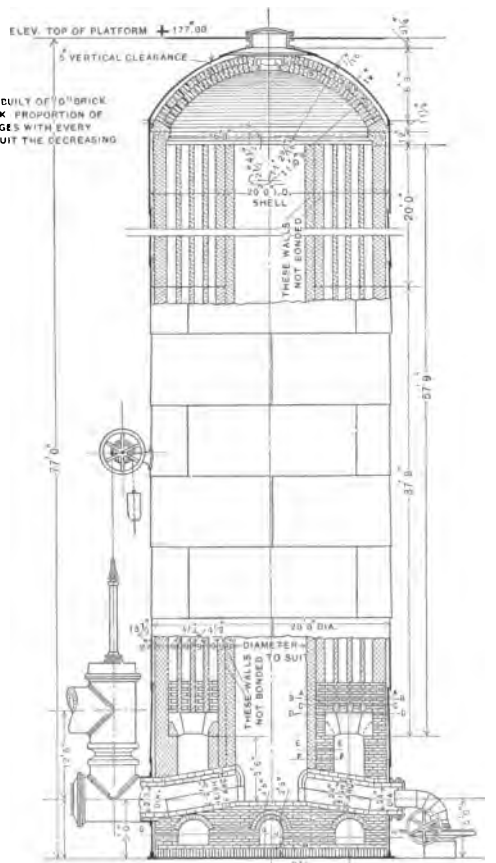
JULIAN KENNEDY STOVE

Julian Kennedy, Pittsburgh, Pa., Engineer


ELEV. TOP OF PLATFORM +127.88
5' VERTICAL CLEARANCE
DOME TO BE BUILT OF 9" BRICK AND 5" BRICK PROPORTION OF WHICH CHANGES WITH EVERY COURSE TO SUIT THE DECREASING DIAMS.
20'0" I.D. SHELL
THESE WALLS NOT BONDED
20.0
87.9
77'6"
37'8"
20'0" DIA.
DIAMETER TO SUIT
THESE WALLS NOT BONDED

SECTION THROUGH GAS BURNER AND HOT BLAST VALVE

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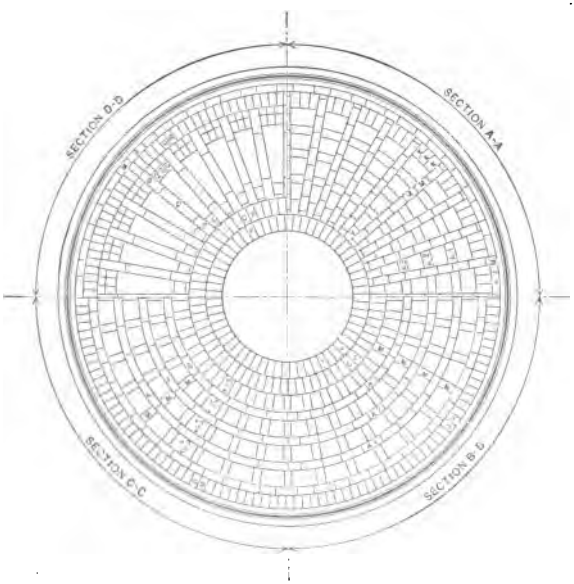
JULIAN KENNEDY STOVE

Julian Kennedy, Pittsburgh, Pa., Engineer



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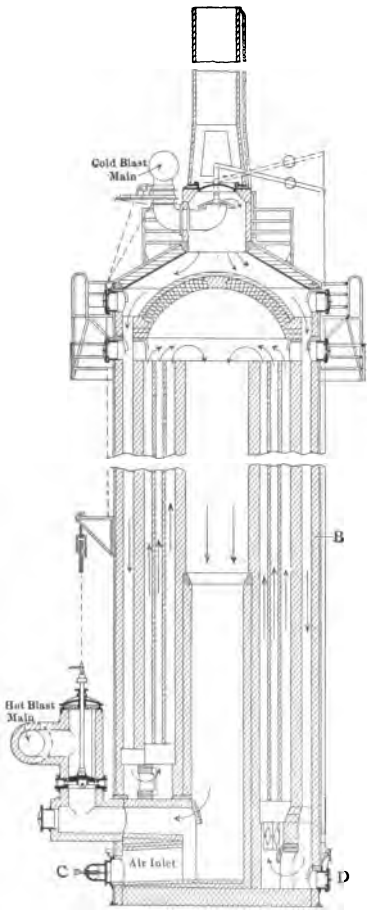
McCLURE-AMSLER PATENT STOVE

G. W. McClure, Son & Co., Pittsburgh, Pa., Engineers



Sectional Elevation

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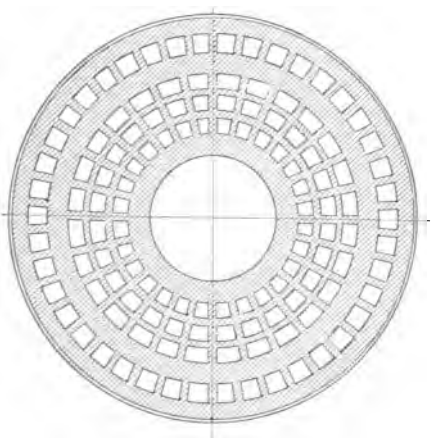
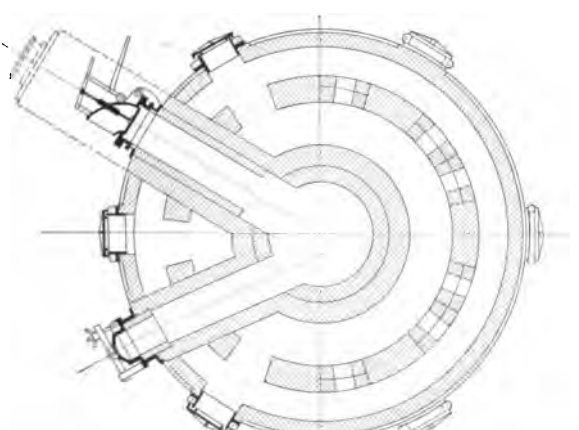
McCLURE-AMSLER PATENT STOVE

G. W. McClure, Son & Co., Pittsburgh, Pa., Engineers



Section Through A B



Section Through C D

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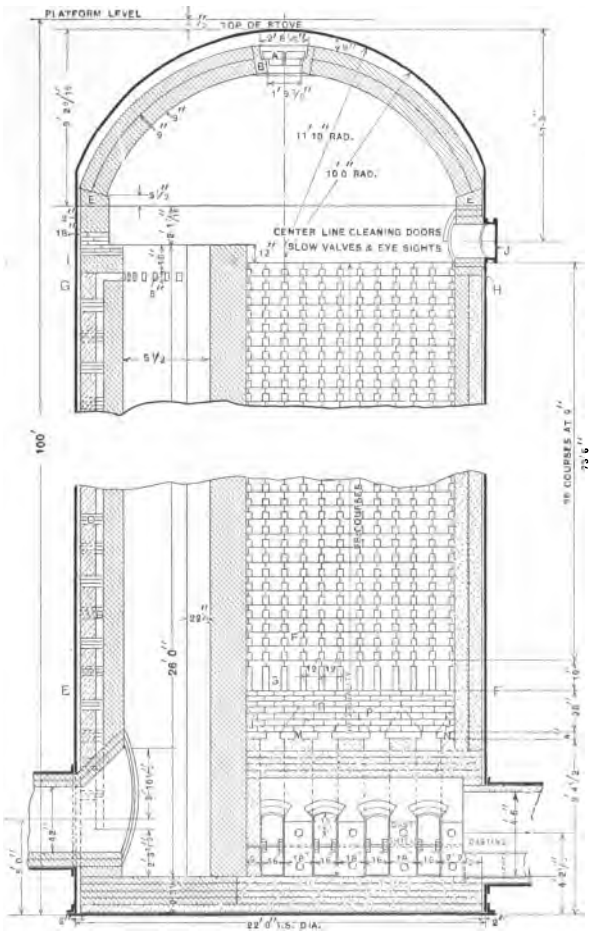
ROBERTS PATENT STOVE

F. C. Roberts & Co., Philadelphia, Pa., Engineers



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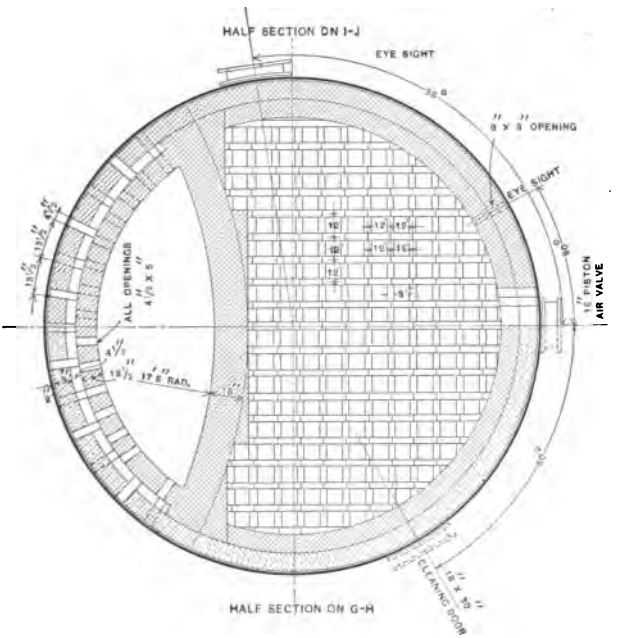
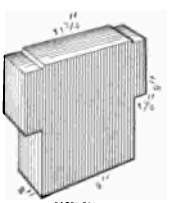
ROBERTS PATENT STOVE

F. C. Roberts & Co., Philadelphia, Pa., Engineers





Checker Brick

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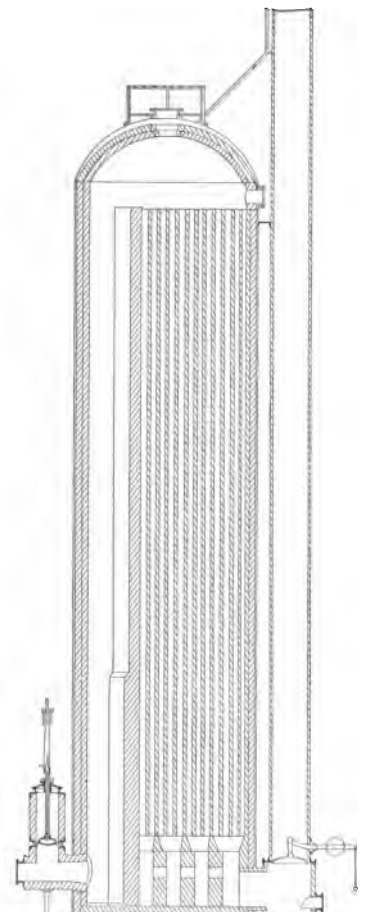
FOOTE PATENT STOVE

D. Lamond & Son, Ferguson Block, Pittsburgh, Pa., Engineers



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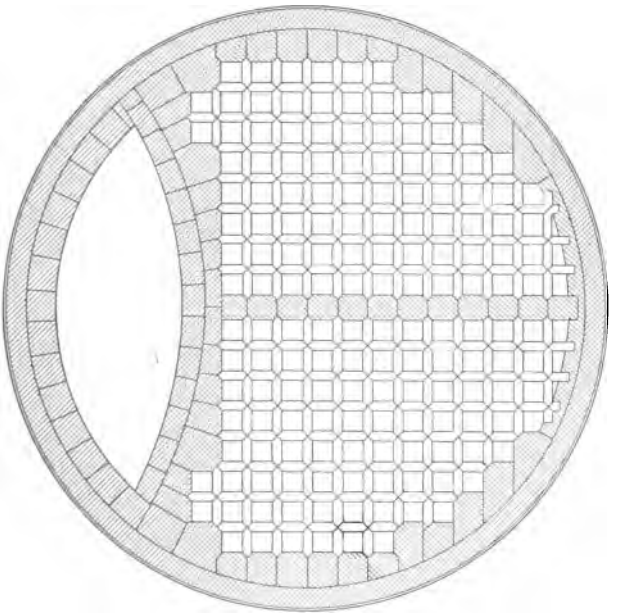
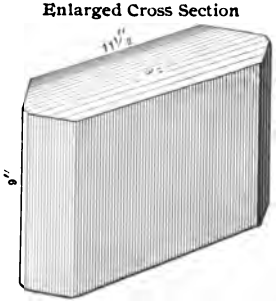
FOOTE STOVE

D. Lamond & Son, Ferguson Block, Pittsburgh, Pa., Engineers



Enlarged Cross Section



Checker Brick

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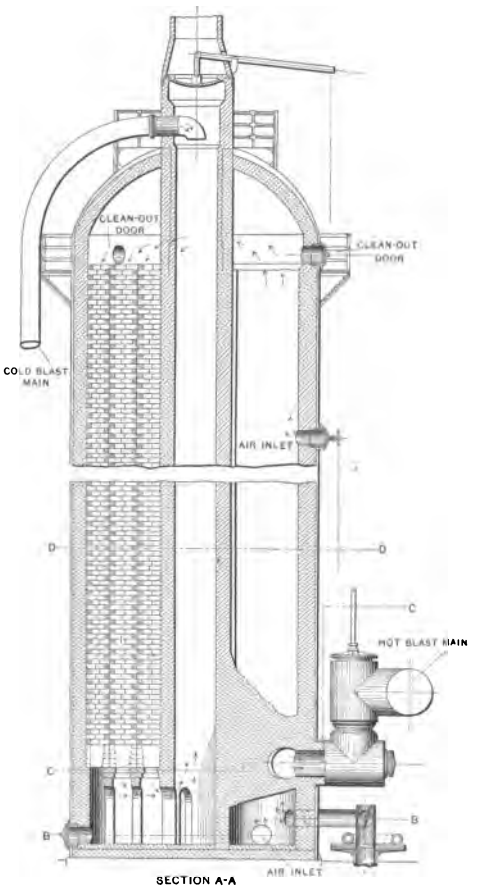
IMPROVED HOT BLAST STOVE

J. W. Calder, Pittsburgh, Pa.



SECTION A-A

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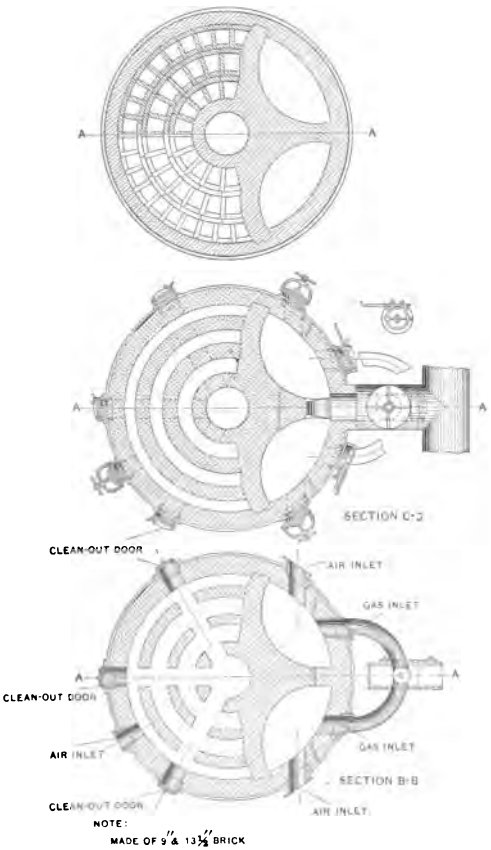
IMPROVED HOT BLAST STOVE

J. W. Calder, Pittsburgh, Pa.



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COKE OVEN BRICK

COKE oven construction has changed radically in recent years. Where formerly any cheap clay brick were deemed good enough for the purpose, of late the tendency has been to use the highest grade brick.

The excellent results recently obtained from the use of silica brick in the severe service of by-product ovens, and from the old beehive ovens in the Connellsville region and other places, have clearly demonstrated that the silica brick is the most economical that can be used in this work, due entirely to the increased length of service obtained by their use.

Our "H-W Crown" brick are made for the crowns of beehive ovens, and in addition to their extreme refractory qualities are especially adapted to hold the crown rigid and true to shape through varying temperatures, making in all a more thorough construction physically than can be obtained by the use of clay brick.

The "XX Sand" brand has been found specially suitable for lasting service as liner brick.

The fronts and floor tile are made of fire clay. Trunnel heads are made of either silica or fire clay, as may be desired.

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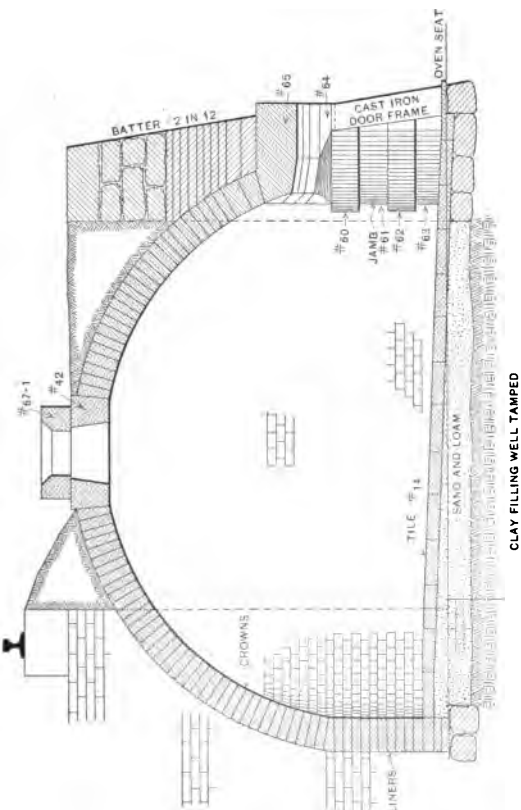
STANDARD COKE OVEN

CROSS SECTION



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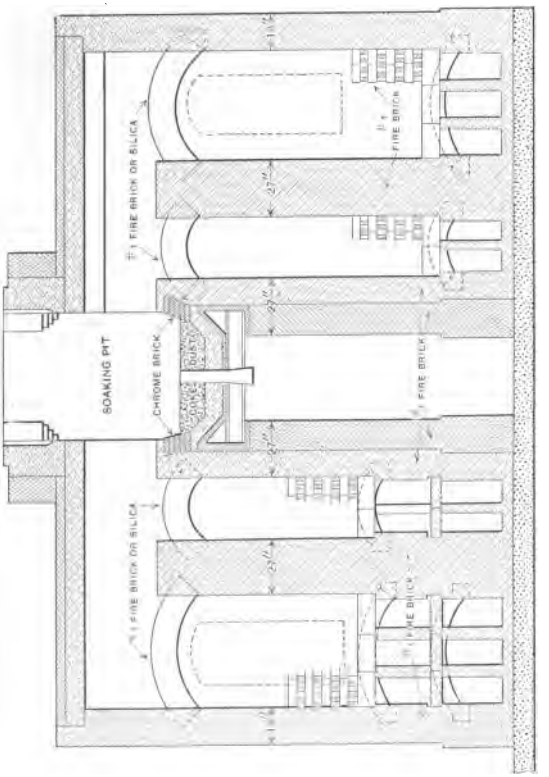
FOUR-HOLE SOAKING PIT FURNACE



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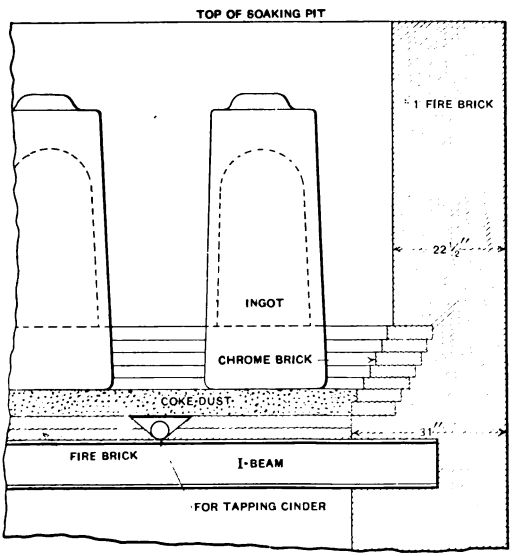
SKETCH OF SOAKING PIT SHOWING USE OF CHROME BRICK



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SIEMENS CRUCIBLE STEEL MELTING FURNACE

ON page 69 is a cut of this furnace showing the shapes of brick commonly used in building it, and on pages 36 and 37 will be found cuts of each special shape indicated in this drawing, all of which we keep in stock.

After 20 years' use in these furnaces, the "Woodland" fire brick still holds its enviable reputation as the best brick in the country for steel-melting furnaces. The "Woodland" fire brick secured the greater part of this trade when it was first introduced into the market, and has held it on its merits ever since, being used in more than seventy-five per cent. of the crucible steel furnaces of the country.

LIST OF SHAPES REQUIRED FOR ONE 6-POT FURNACE

Shape No.	No. Pieces	Where Used
A	30	1st and 2d courses in wall
A A	4	Over port openings
B	18	3rd course in wall
C	20	4th course in wall
2	6	Between piers
3	12	Pier brick
4	2	On tops of piers
5	2	On tops of piers
6	2	On tops of piers

We carry the above shapes in "Silica" also, many consumers preferring silica to clay shapes for these furnaces.

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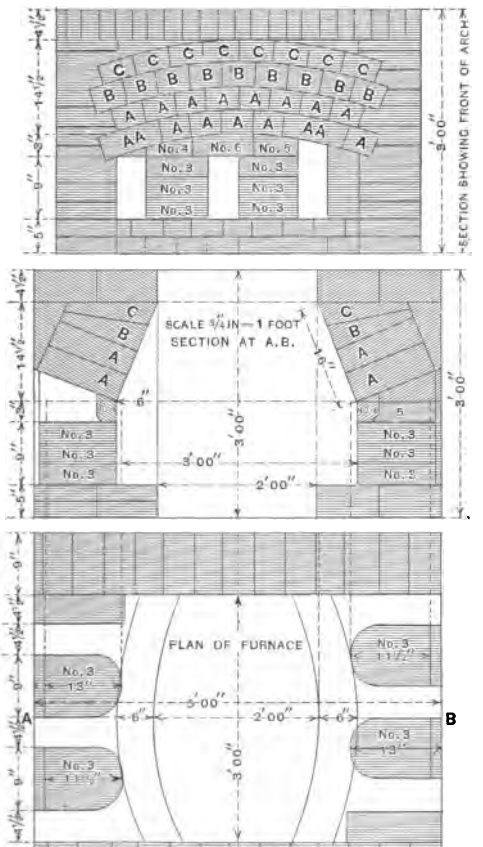
PLAN OF SIEMENS STEEL FURNACE.



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OUR PLAN OF SHAPES

FOR SIEMENS CRUCIBLE STEEL MELTING FURNACE

ON page 71 will be found a system of shapes for above furnace designed by ourselves. The plan differs from any heretofore used in having the side walls, or walls over the ports, built with horizontal joints, thus doing away with the arched side walls.

The advantages are, that having all joints or courses of brick horizontal, the side walls are not inclined to pitch into the furnace, as with the old style of shapes; all the shapes extend back to the breast wall, thus making a tight joint the full height of the furnace and preventing the gas from working up between the breast wall and the furnace wall. All of the walls having a straight, solid bearing, the settling will be uniform throughout the furnace, thus avoiding the opening or shattering of the walls by unequal settling. The shapes being of simple pattern, a mason can build a furnace with these shapes in less time than is required with others.

IT REQUIRES THE FOLLOWING SHAPES TO BUILD ONE 6-POT HOLE

No. 2	6 pieces	
No. 3	12 "	
Nos. 7 to 32	2 "	each
No. 33	4 "	
No. 34	4 "	
No. 35	4 "	
9-inch	600 "	

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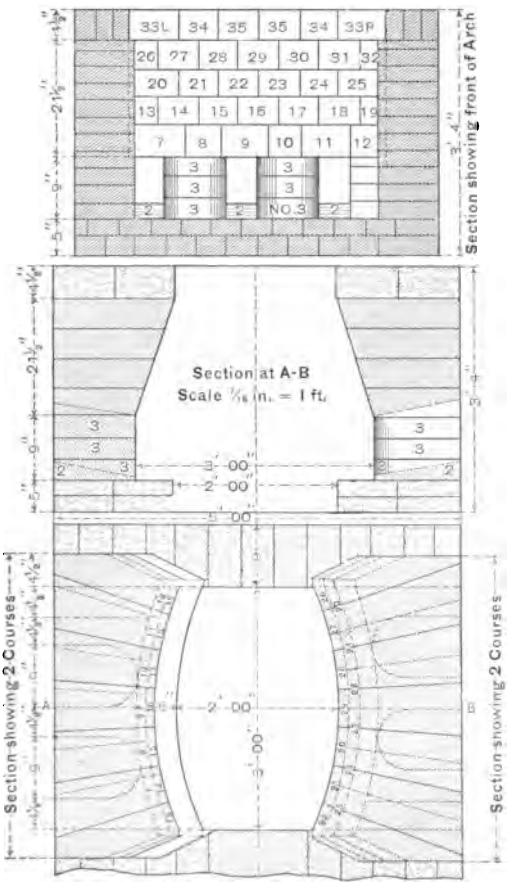
OUR PLAN OF SHAPES FOR SIEMENS CRUCIBLE STEEL MELTING FURNACE



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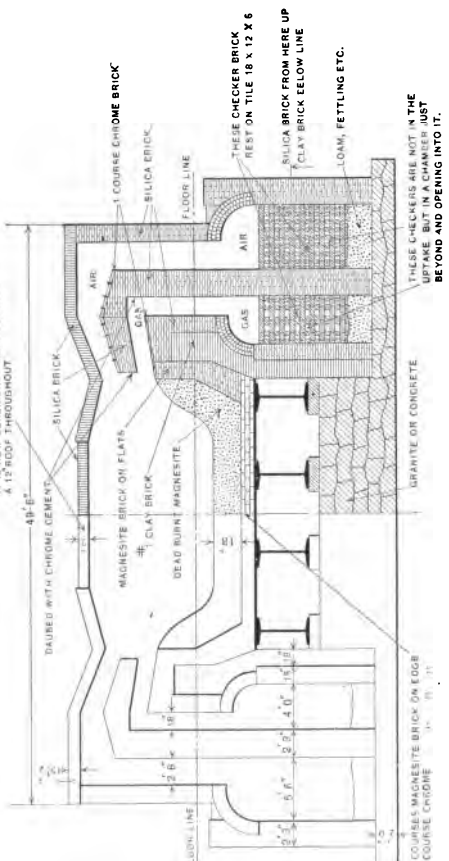
SECTION OF BASIC OPEN HEARTH FURNACE 40 TON—USING ARTIFICIAL GAS


IT IS NOW CONSIDERED BEST TO HAVE A 12" ROOF THROUGHOUT
DAUBED WITH CHROME CEMENT
49'-8"
SILICA BRICK
AIR
GAS
MAGNESITE BRICK ON FLATS
CLAY BRICK
DEAD BURNT MAGNESITE
1 COURSE CHROME BRICK
SILICA BRICK
FLOOR LINE
AIR
GAS
THESE CHECKER BRICK REST ON TILE 18 X 12 X 6
SILICA BRICK FROM HERE UP
CLAY BRICK BELOW LINE
LOAM, FETTLING ETC.
GRANITE OR CONCRETE
THESE CHECKERS ARE NOT IN THE UPTAKE BUT IN A CHAMBER JUST BEYOND AND OPENING INTO IT.
2 COURSES MAGNESITE BRICK ON EDGE
1 COURSE CHROME
ELLUM LINE

Note—This is not a particular furnace, but is a generalization, the idea being to show the prevailing best brick practice.

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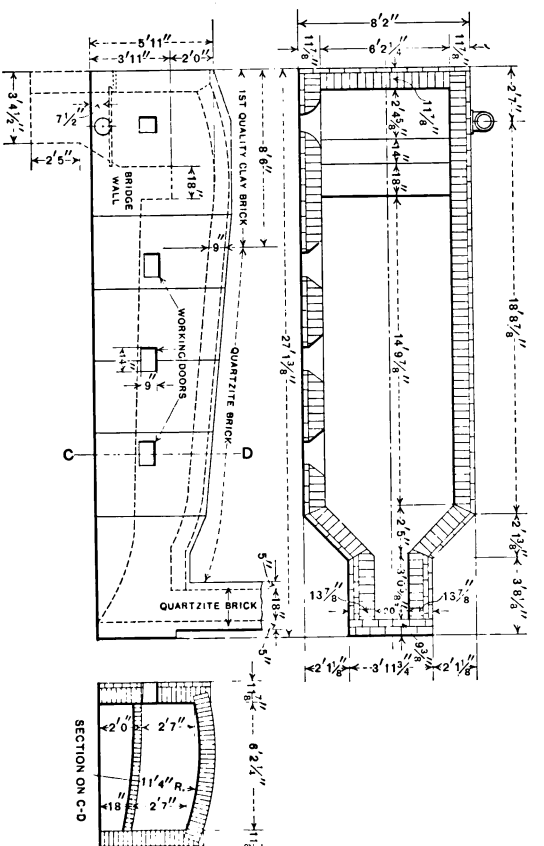
TYPICAL HEATING FURNACE SHOWING BRANDS OF BRICK USED



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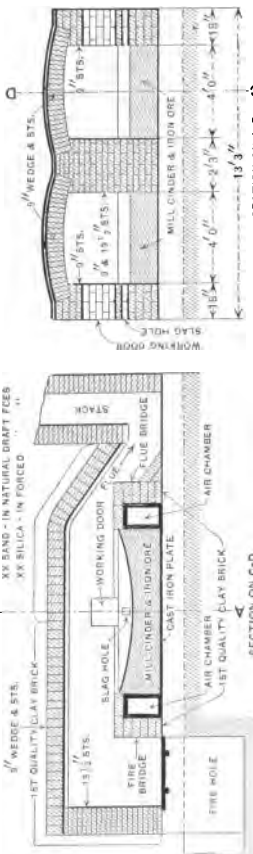
SECTION OF TYPICAL PUDDLING FURNACE



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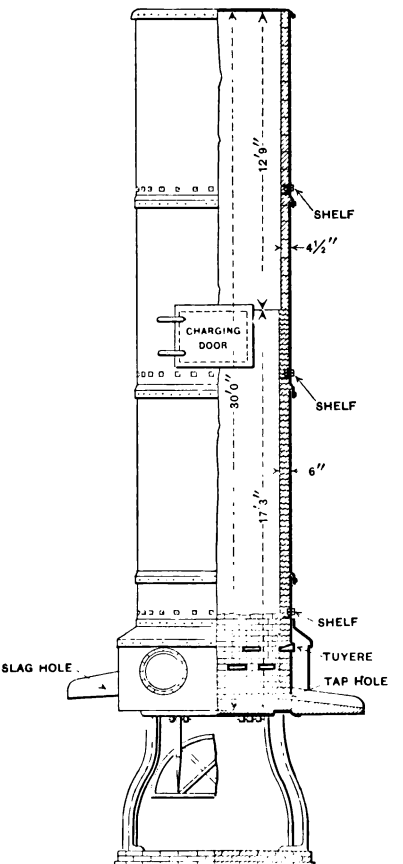
SECTION OF TYPICAL CUPOLA



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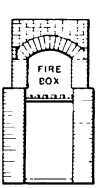
TYPICAL LIME KILN LINING

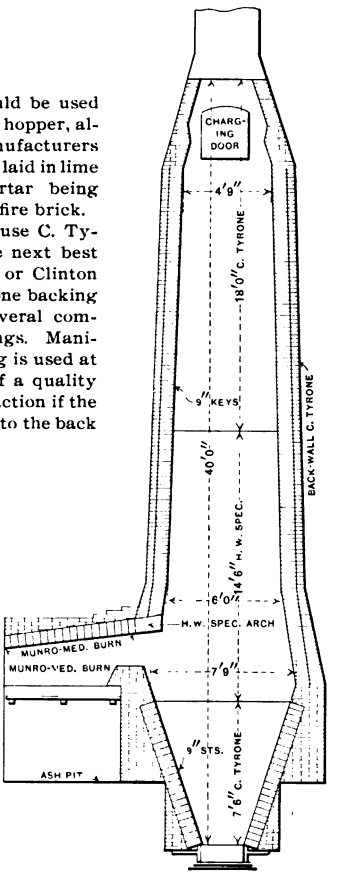
AS RECOMMENDED BY HARBISON-WALKER REFRACTORIES CO.

C. Tyrone should be used for backing and hopper, although some manufacturers use common brick laid in lime mortar, this mortar being very injurious to fire brick.

If you cannot use C. Tyrone backing, the next best thing is W. F. B. or Clinton brand. A C. Tyrone backing should outlast several common brick backings. Manifestly, if a backing is used at all it should be of a quality to withstand the action if the kiln cuts through to the back lining.



3-FIRE HOLES TO ONE KILN



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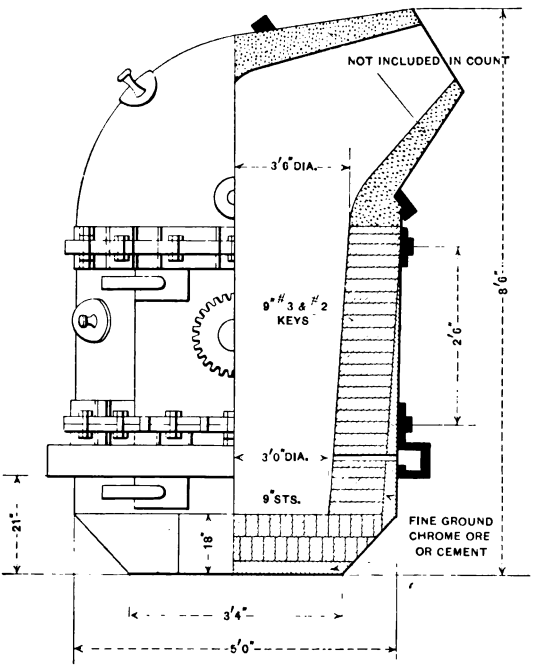
SPECIAL SHAPES FOR BASIC LINING FOR COPPER CONVERTER



SHAPES REQUIRED FOR ONE LINING AS SHOWN

Shapes	Quality	Pieces Required
9-inch No. 3 Key.....	Chrome or Magnesite....	875
9-inch No. 2 Key.....	Chrome or Magnesite....	125
9-inch Sts.....	Chrome or Magnesite....	205
Total 9 Inch Equivalent.....		1209

Note—Count and dimensions are approximate

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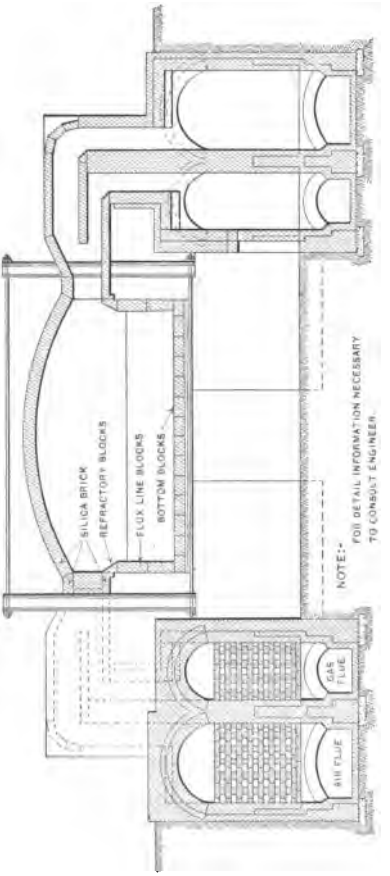
CROSS SECTION OF TYPICAL PRODUCER GAS GLASS TANK



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GENERAL INFORMATION ABOUT FIRE BRICK

All fire brick should be kept in a dry place. Moisture, especially in cold weather, will greatly injure any brick.

Good brick work depends much on the following points:

Use of good fire clay (equal in refractoriness to the brick itself) applied very thin, preferably dipped and rubbed close.

Slow warming up to expel moisture.

Attention to fact that fire clay brick contract slightly and silica brick expand under high temperatures.

Lighter burned fire clay brick in roofs will usually give better service than hard burned brick.

The refractoriness of silica brick is greatly decreased by sudden heating up.

From 250 to 350 pounds of fire clay or silica cement is enough to lay up one thousand brick. Fine ground fire clay should be used for laying up fire clay brick and silica cement for silica brick. In first class brick work, less than three hundred and fifty pounds of fire clay per thousand brick should be used.

For approximate estimating on fire brick work, use the following figures:

1 square foot 4½-inch wall requires 7 brick
1 square foot 9-inch wall requires 14 brick
1 square foot 13½-inch wall requires 21 brick
1 cubic foot brick work requires 17 nine-inch straight brick
1 cubic foot fire clay brick work weighs 150 pounds
1 cubic foot silica brick work weighs 130 pounds
1000 brick (closely stacked) occupies 56 cubic feet
1000 brick (loosely stacked) occupies 72 cubic feet

Magnesite and chrome brick, although highly refractory, are only suitable for use in places where they have to withstand the action of hot basic slags, fumes, etc. Fire clay or silica brick are recommended for other places.

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BRICK TABLES

THE following tables show how a circle or arch of any diameter may be laid up with a combination of the standard size fire brick, as designated in this catalogue.

TABLE OF WEDGE BRICK

Inside Diameter	No. 2 Wedge	No. 1 Wedge	Square	Total
2 ft. 0 in.	.....	.....	.....	
2 " 6 "	60.5	.....	.....	60.5
3 " 0 "	48.	19.6	.....	68.
3 " 6 "	36.	40.	.....	76.
4 " 0 "	24.	59.	.....	83.
4 " 6 "	12.0637	79.	.....	91.
5 " 0 "	.....	98.	.....	98.
5 " 6 "	.....	98.	7.5	106.
6 " 0 "	.....	98.	15.	113.
6 " 6 "	.....	98.	23.	121.
7 " 0 "	.....	98.	30.	128.
7 " 6 "	.....	98.	38.	136.
8 " 0 "	.....	98.	46.	144.
8 " 6 "	.....	98.	53.	151.
9 " 0 "	.....	98.	61.	159.
9 " 6 "	.....	98.	68.	166.
10 " 0 "	.....	98.	76.	174.
10 " 6 "	.....	98.	83.	181.
11 " 0 "	.....	98.	91.	189.
11 " 6 "	.....	98.	98.	196.
12 " 0 "	.....	98.	106.	204.

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TABLE OF ARCH BRICK

Inside Diameter	No. 3 Arch	No. 2 Arch	No. 1 Arch	Straight	Total
0 ft. 6 in.	18.	.....	.....	.....	18.
1 " 0 "	13.	13.	.....	.....	26.
1 " 6 "	4.	29.	.....	.....	33.
2 " 0 "	.....	41.5	.....	.....	41.5
2 " 6 "	.....	31.	18.	.....	49.
3 " 0 "	.....	21.	36.	.....	57.
3 " 6 "	.....	10.3673	54.	.....	64.
4 " 0 "	.....	.....	72.	.....	72.
4 " 6 "	.....	.....	72.	7.5	80.
5 " 0 "	.....	.....	72.	15.	87.
5 " 6 "	.....	.....	72.	23.	95.
6 " 0 "	.....	.....	72.	30.	102.
6 " 6 "	.....	.....	72.	38.	110.
7 " 0 "	.....	.....	72.	45.	117.
7 " 6 "	.....	.....	72.	53.	125.
8 " 0 "	.....	.....	72.	60.	132.
8 " 6 "	.....	.....	72.	68.	140.
9 " 0 "	.....	.....	72.	75.	147.
9 " 6 "	.....	.....	72.	83.	155.
10 " 0 "	.....	.....	72.	90.	162.
10 " 6 "	.....	.....	72.	98.	170.
11 " 0 "	.....	.....	72.	105.	177.
11 " 6 "	.....	.....	72.	113.	185.
12 " 0 "	.....	.....	72.	121.	193.

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TABLE OF 9-INCH KEY BRICK

Inside Diameter	No. 4 Key	No. 3 Key	No. 2 Key	No. 1 Key	Sq.	Total
1 ft. 6 in.	25.1328	.....	.....	.....	....	25.
2 " 0 "	17.	12.5	.....	.....	....	30.
2 " 6 "	8.3776	25.	.....	.....	....	34.
3 " 0 "	.....	38.	.....	.....	....	38.
3 " 6 "	.....	32.	10.5	.....	....	42.
4 " 0 "	.....	25.	21.	.....	....	46.
4 " 6 "	.....	19.	32.	.....	....	51.
5 " 0 "	.....	13.	42.	.....	....	55.
5 " 6 "	.....	6.	53.	.....	....	59.
6 " 0 "	.....	.....	63.	.....	....	63.
6 " 6 "	.....	.....	58.	9.5	....	67.
7 " 0 "	.....	.....	52.	19.	....	71.
7 " 6 "	.....	.....	47.	29.	....	76.
8 " 0 "	.....	.....	42.	38.	....	80.
8 " 6 "	.....	.....	37.	47.	....	84.
9 " 0 "	.....	.....	31.	57.	....	88.
9 " 6 "	.....	.....	26.	66.	....	92.
10 " 0 "	.....	.....	21.	76.	....	97.
10 " 6 "	.....	.....	16.	85.	....	101.
11 " 0 "	.....	.....	11.	94.	....	105.
11 " 6 "	.....	.....	5.236	104.	....	109.
12 " 0 "	.....	.....	.....	113.	....	113.

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TABLE OF 9-INCH KEY BRICK

CONTINUED

Inside Diameter	No. 1 Key	Square	Total
12 ft. 6 in.	113.	4.	117.
13 " 0 "	113.	9.	122.
13 " 6 "	113.	13.	126.
14 " 0 "	113.	17.	130.
14 " 6 "	113.	21.	134.
15 " 0 "	113.	26.	139.
15 " 6 "	113.	30.	143.
16 " 0 "	113.	34.	147.
16 " 6 "	113.	38.	151.
17 " 0 "	113.	42.	155.
17 " 6 "	113.	46.	159.
18 " 0 "	113.	51.	164.
18 " 6 "	113.	55.	168.
19 " 0 "	113.	59.	172.
19 " 6 "	113.	63.	176.
20 " 0 "	113.	67.	180.
20 " 6 "	113.	72.	185.
21 " 0 "	113.	76.	189.
21 " 6 "	113.	80.	193.
22 " 0 "	113.	84.	197.
22 " 6 "	113.	88.	201.
23 " 0 "	113.	93.	206.
23 " 6 "	113.	97.	210.

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TABLE OF 9-INCH KEY BRICK

CONTINUED

Inside Diameter	No. 1 Key	Square	Total
24 ft. 0 in.	113.	101.	214.
24 " 6 "	113.	105.	218.
25 " 0 "	113.	109.	222.
25 " 6 "	113.	113.	226.
26 " 0 "	113.	117.	230.
26 " 6 "	113.	121.	234.
27 " 0 "	113.	126.	239.
27 " 6 "	113.	130.	243.
28 " 0 "	113.	134.	247.
28 " 6 "	113.	138.	251.
29 " 0 "	113.	142.	255.
29 " 6 "	113.	147.	260.
30 " 0 "	113.	151.	264.
30 " 6 "	113.	155.	268.
31 " 0 "	113.	159.	272.
31 " 6 "	113.	163.	276.
32 " 0 "	113.	168.	281.
32 " 6 "	113.	172.	285.
33 " 0 "	113.	176.	289.
33 " 6 "	113.	180.	293.
34 " 0 "	113.	184.	297.
34 " 6 "	113.	188.	301.
35 " 0 "	113.	193.	306.

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TABLE OF 13½-INCH KEY BRICK

Inside Diameter	No. 4 Key	No. 2 Key	Square	Total
6 ft. 0 in.	52.	.....	.....	52.
6 " 6 "	48.	7.5	.....	55.
7 " 0 "	44.	15.	.....	59.
7 " 6 "	39.	23.	.....	62.
8 " 0 "	35.	30.	.....	65.
8 " 6 "	30.	38.	.....	68.
9 " 0 "	26.	45.	.....	71.
9 " 6 "	22.	52.	.....	74.
10 " 0 "	17.	60.	.....	77.
10 " 6 "	13.	67.	.....	80.
11 " 0 "	9.	75.	.....	84.
11 " 6 "	4.5	82.	.....	87.
12 " 0 "	.....	90.	.....	90.
12 " 6 "	.....	90.	3.5	93.5
13 " 0 "	.....	90.	7.	97.
13 " 6 "	.....	90.	10.	100.
14 " 0 "	.....	90.	13.	103.
14 " 6 "	.....	90.	16.	106.
15 " 0 "	.....	90.	20.	110.
15 " 6 "	.....	90.	23.	113.
16 " 0 "	.....	90.	26.	116.
16 " 6 "	.....	90.	29.	119.

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TABLE OF 13½-INCH KEY BRICK

CONTINUED

Inside Diameter	No. 2 Key	Square	Total
17 ft. 0 in.....	90.	32.	122.
17 " 6 "	90.	35.	125.
18 " 0 "	90.	38.	128.
18 " 6 "	90.	42.	132.
19 " 0 "	90.	45.	135.
19 " 6 "	90.	48.	138.
20 " 0 "	90.	51.	141.
20 " 6 "	90.	54.	144.
21 " 0 "	90.	57.	147.
21 " 6 "	90.	60.	150.
22 " 0 "	90.	63.	153.
22 " 6 "	90.	66.	156.
23 " 0 "	90.	70.	160.
23 " 6 "	90.	73.	163.
24 " 0 "	90.	76.	166.
24 " 6 "	90.	79.	169.
25 " 0 "	90.	82.	172.
25 " 6 "	90.	85.	175.
26 " 0 "	90.	88.	178.
26 " 6 "	90.	92.	182.
27 " 0 "	90.	95.	185.
27 " 6 "	90.	98.	188.
28 " 0 "	90.	101.	191.

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TABLE OF 13½-INCH KEY BRICK

CONTINUED

Inside Diameter	No. 2 Key	Square	Total
28 ft. 6 in.....	90.	104.	194.
29 " 0 "	90.	107.	197.
29 " 6 "	90.	110.	200.
30 " 0 "	90.	114.	204.
30 " 6 "	90.	117.	207.
31 " 0 "	90.	120.	210.
31 " 6 "	90.	123.	213.
32 " 0 "	90.	126.	216.
32 " 6 "	90.	129.	219.
33 " 0 "	90.	132.	222.
33 " 6 "	90.	136.	226.
34 " 0 "	90.	139.	229.
34 " 6 "	90.	142.	232.
35 " 0 "	90.	145.	235.

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TABLE OF 9 x 6 INCH KEY BRICK

Inside Diameter	Key 9 x 6 x 5⅜ x 2½"	Straight 9 x 6 x 2½"	Total
12 ft. 0 in.	85.	0.	85.
12 " 6 "	85.	3.	88.
13 " 0 "	85.	6.	91.
13 " 6 "	85.	9.	94.
14 " 0 "	85.	12.	97.
14 " 6 "	85.	15.	100.
15 " 0 "	85.	18.	103.
15 " 6 "	85.	21.	106.
16 " 0 "	85.	24.	109.
16 " 6 "	85.	28.	113.
17 " 0 "	85.	31.	116.
17 " 6 "	85.	34.	119.
18 " 0 "	85.	37.	122.
18 " 6 "	85.	40.	125.
19 " 0 "	85.	43.	128.
19 " 6 "	85.	46.	131.
20 " 0 "	85.	49.	134.
20 " 6 "	85.	53.	138.
21 " 0 "	85.	56.	141.
21 " 6 "	85.	59.	144.
22 " 0 "	85.	62.	147.
22 " 6 "	85.	65.	150.
23 " 0 "	85.	68.	153.
23 " 6 "	85.	71.	156.
24 " 0 "	85.	75.	160.
24 " 6 "	85.	78.	163.
25 " 0 "	85.	81.	166.
25 " 6 "	85.	84.	169.
26 " 0 "	85.	87.	172.

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TABLE OF GAS FLUE ARCH BRICK

FOR BLAST FURNACE TOP OPENINGS

Inside Diameter Openings	Shapes Required			
	No. 3	No. 4	No. 5	Squares
3 ft. 0 in.	49			
3 ft. 6 in.	23	31		
4 ft. 0 in.		60		
4 ft. 6 in.		26	39	
5 ft. 0 in.			70	
5 ft. 6 in.			70	6
6 ft. 0 in.			70	11
6 ft. 6 in.			70	16
7 ft. 0 in			70	22
7 ft. 6 in.			70	27
8 ft. 0 in.			70	33
8 ft. 6 in.			70	38
9 ft. 0 in.			70	43

CUPOLA BLOCKS

FOR SPECIAL DIAMETERS

Inside Diameter Cupola	Shapes Required			
	No. 1	No. 2	No. 3	No. 4
2 ft. 6 in.	15			
2 ft. 9 in.	8	8		
3 ft. 0 in.		17		
3 ft. 3 in.		12	6	
3 ft. 6 in.		8	11	
3 ft. 9 in		4	16	
4 ft. 0 in.			21	
4 ft. 3 in.			15	7
4 ft. 6 in.			10	13
4 ft. 9 in.			5	19
5 ft. 0 in.				25

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TABLE OF SILICA, 12-INCH WEDGE BRICK

Inside Diameter	No. 2 Wedge 12 x 6 x 2⅞ x 2½"	No. 1 Wedge 12 x 6 x 2 1/16 x 2½"	Squares	Total
12 ft. 0 in.	181	.....	.....	181
12 " 6 "	173	15	.....	188
13 " 0 "	166	30	.....	196
13 " 6 "	158	45	.....	203
14 " 0 "	151	60	.....	211
14 " 6 "	143	75	.....	218
15 " 0 "	136	90	.....	226
15 " 6 "	128	106	.....	234
16 " 0 "	121	121	.....	242
16 " 6 "	113	136	.....	249
17 " 0 "	106	151	.....	257
17 " 6 "	98	166	.....	264
18 " 0 "	91	181	.....	272
18 " 6 "	83	196	.....	279
19 " 0 "	76	211	.....	287
19 " 6 "	68	226	.....	294
20 " 0 "	61	241	.....	302
20 " 6 "	53	256	.....	309
21 " 0 "	46	271	.....	317
21 " 6 "	38	287	.....	325
22 " 0 "	31	302	.....	333
22 " 6 "	23	317	.....	340
23 " 0 "	16	332	.....	348
23 " 6 "	8	347	.....	355
24 " 0 "	.....	362	.....	362
24 " 6 "	.....	362	8	370
25 " 0 "	.....	362	15	377
25 " 6 "	.....	362	23	385
26 " 0 "	.....	362	30	392
26 " 6 "	.....	362	38	400
27 " 0 "	.....	362	45	407
27 " 6 "	.....	362	53	415
28 " 0 "	.....	362	60	422
28 " 6 "	.....	362	68	430
29 " 0 "	.....	362	75	437
29 " 6 "	.....	362	83	445
30 " 0 "	.....	362	90	452
30 " 6 "	.....	362	98	460
31 " 0 "	.....	362	105	467
31 " 6 "	.....	362	113	475
32 " 0 "	.....	362	120	482
32 " 6 "	.....	362	128	490
33 " 0 "	.....	362	135	497
33 " 6 "	.....	362	143	505
34 " 0 "	.....	362	150	512
34 " 6 "	.....	362	158	520
35 " 0 "	.....	362	165	527
35 " 6 "	.....	362	173	535
36 " 0 "	.....	362	181	543

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STANDARD BOTTOM BLOCKS

IN ONE COURSE OF FOLLOWING DIAMETERS

Diameter	No. Blocks	Diameter	No. Blocks
8′ 0″	86	17′ 0″	387
8′ 6″	97	17′ 6″	410
9′ 0″	108	18′ 0″	434
9′ 6″	121	18′ 6″	459
10′ 0″	134	19′ 0″	484
10′ 6″	148	19′ 6″	509
11′ 0″	162	20′ 0″	536
11′ 6″	177	20′ 6″	563
12′ 0″	194	21′ 0″	591
12′ 6″	209	21′ 6″	619
13′ 0″	226	22′ 0″	648
13′ 6″	244	22′ 6″	677
14′ 0″	263	23′ 0″	709
14′ 6″	282	23′ 6″	740
15′ 0″	301	24′ 0″	771
15′ 6″	322	24′ 6″	804
16′ 0″	343	25′ 0″	837
16′ 6″	364	25′ 6″	871

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TEMPERATURES

The following table affords a somewhat rough method of estimating high temperature.

	Centigrade Degrees	Fahrenheit Degrees
Just glowing in the dark	525	977
Dark red	700	1252
Cherry red	908	1666
Bright cherry red	1000	1832
Orange	1150	2102
White	1300	2372
Dazzling white	1500	2732

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TEMPERATURES

Below we give the temperatures of iron, steel and other metals, under various conditions, according to the latest scientific investigations.

	Centigrade Degrees	Fahrenheit Degrees
Mercury.....melts	40	40
Mercury.....boils	349	660
Tin.....melts	229	445
Lead.....melts	322	612
Lead.....boils	1040	1904
Zinc.....melts	412	775
Zinc.....boils	1040	1904
Aluminum.....melts	700	1252
Silver.....melts	957	1775
Brass.....melts	1021	1870
Copper.....melts	1029	1885
Gold.....melts	1038	1900
Cobalt.....melts	1100	2012
Cast Iron, white.....melts	1135	2075
Cast Iron, gray.....melts	1222	2230
Steel.....melts	1300	2372
Iron, wrought.....melts	1500	2732
Nickel.....melts	1500	2732
Platinum.....melts	2533	4593
Glass Furnace, between the pots.	1375	2507
In the pots, refining.....	1310	2390
In the pots, working.....	1045	1913
Tanks melted for casting.....	1310	2390
Annealing Glassware.....	444 to 555	800 to 1000
Siemens Crucible Steel Furnace varies from.....	1230 to 1330	2246 to 2426

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TEMPERATURES

	Centigrade Degrees	Fahrenheit Degrees
BESSEMER PROCESS		
Running the slag	1580	2876
Running steel into ladle	1640	2984
Running steel into mould	1580	2876
Annealing furnace, ingot in	1200	2192
Ingot under hammer	1080	1976
OPEN HEARTH PROCESS		
Gas from producers	720	1328
Gas entering generator	400	752
Gas leaving generator	1200	2192
Air leaving generator	1000	1832
Fumes passing to shaft	300	572
End of fusion of charge	1420	2588
Refining the steel	1500	2732
Running into ladle, first	1580	2876
Running into ladle, last	1490	2714
BLAST FURNACE—GRAY BESSEMER		
Front of tuyere	1930	3506
At tapping	1570	2858

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CIRCUMFERENCES AND AREAS OF CIRCLES

FROM 1-64 TO 50

Diam.	Circum.	Area	Diam.	Circum.	Area
1/64	.04909	.000192	4	12.5664	12.5664
1/32	.09818	.000767	4 1/8	12.9591	13.3641
3/64	.19635	.003068	4 1/4	13.3518	14.1863
1/16	.3927	.012272	4 3/8	13.7445	15.033
5/64	.589	.027612	4 1/2	14.1372	15.9043
1/8	.7854	.049087	4 5/8	14.5299	16.8002
9/64	.98175	.076699	4 3/4	14.9226	17.7206
3/16	1.1781	.110447	4 7/8	15.3153	18.6555
7/64	1.37445	.15033			
1/4	1.5708	.19635	5	15.708	19.635
9/64	1.76715	.248505	5 1/8	16.1007	20.629
5/16	1.9635	.306796	5 1/4	16.4934	21.6476
11/64	2.15985	.371224	5 3/8	16.8861	22.6907
3/8	2.3562	.441787	5 1/2	17.2788	23.7583
13/64	2.55255	.518487	5 5/8	17.6715	24.8505
7/16	2.7489	.601322	5 3/4	18.0642	25.9673
15/64	2.94525	.690292	5 7/8	18.4569	27.1086
1	3.1416	.7854	6	18.8496	28.2744
1 1/8	3.5343	.99402	6 1/8	19.2423	29.4648
1 1/4	3.927	1.2272	6 1/4	19.635	30.6797
1 3/8	4.3197	1.4849	6 3/8	20.0277	31.9191
1 1/2	4.7124	1.7671	6 1/2	20.4204	33.1831
1 5/8	5.1051	2.0739	6 5/8	20.8131	34.4717
1 3/4	5.4978	2.4053	6 3/4	21.2058	35.7848
1 7/8	5.8905	2.7612	6 7/8	21.5985	37.1224
2	6.2832	3.1416	7	21.9912	38.4846
2 1/8	6.6759	3.5466	7 1/8	22.3839	39.8713
2 1/4	7.0686	3.9761	7 1/4	22.7766	41.2826
2 3/8	7.4613	4.4301	7 3/8	23.1693	42.7184
2 1/2	7.854	4.9087	7 1/2	23.562	44.1787
2 5/8	8.2467	5.4119	7 5/8	23.9547	45.6636
2 3/4	8.6394	5.9396	7 3/4	24.3474	47.1731
2 7/8	9.0321	6.4918	7 7/8	24.7401	48.7071
3	9.4248	7.0686	8	25.1328	50.2656
3 1/8	9.8175	7.6699	8 1/8	25.5255	51.8487
3 1/4	10.2102	8.2958	8 1/4	25.9182	53.4563
3 3/8	10.6029	8.9462	8 3/8	26.3109	55.0884
3 1/2	10.9956	9.6211	8 1/2	26.7036	56.7451
3 5/8	11.3883	10.3206	8 5/8	27.0963	58.4264
3 3/4	11.781	11.0447	8 3/4	27.489	60.1322
3 7/8	12.1737	11.7933	8 7/8	27.8817	61.8625

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CIRCUMFERENCES AND AREAS OF CIRCLES CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
9	28.2744	63.6174	15	47.124	176.715
9⅛	28.6671	65.3968	15⅛	47.5167	179.673
9¼	29.0598	67.2008	15¼	47.9094	182.655
9⅜	29.4525	69.0293	15⅜	48.3021	185.661
9½	29.8452	70.8823	15½	48.6948	188.692
9⅝	30.2379	72.7599	15⅝	49.0875	191.748
9¾	30.6306	74.6621	15¾	49.4802	194.828
9⅞	31.0233	76.5888	15⅞	49.8729	197.933
10	31.416	78.54	16	50.2656	201.062
10⅛	31.8087	80.5158	16⅛	50.6583	204.216
10¼	32.2014	82.5161	16¼	51.051	207.395
10⅜	32.5941	84.5409	16⅜	51.4437	210.598
10½	32.9868	86.5903	16½	51.8364	213.825
10⅝	33.3795	88.6643	16⅝	52.2291	217.077
10¾	33.7722	90.7628	16¾	52.6218	220.354
10⅞	34.1649	92.8858	16⅞	53.0145	223.655
11	34.5576	95.0334	17	53.4072	226.981
11⅛	34.9503	97.2055	17⅛	53.7999	230.331
11¼	35.343	99.4022	17¼	54.1926	233.706
11⅜	35.7357	101.6234	17⅜	54.5853	237.105
11½	36.1284	103.8691	17½	54.978	240.529
11⅝	36.5211	106.1394	17⅝	55.3707	243.977
11¾	36.9138	108.4343	17¾	55.7634	247.45
11⅞	37.3065	110.7537	17⅞	56.1561	250.948
12	37.6992	113.098	18	56.5488	254.47
12⅛	38.0919	115.466	18⅛	56.9415	258.016
12¼	38.4846	117.859	18¼	57.3342	261.587
12⅜	38.8773	120.277	18⅜	57.7269	265.183
12½	39.27	122.719	18½	58.1196	268.803
12⅝	39.6627	125.185	18⅝	58.5123	272.448
12¾	40.0554	127.677	18¾	58.905	276.117
12⅞	40.4481	130.192	18⅞	59.2977	279.811
13	40.8408	132.733	19	59.6904	283.529
13⅛	41.2335	135.297	19⅛	60.0831	287.272
13¼	41.6262	137.887	19¼	60.4758	291.04
13⅜	42.0189	140.501	19⅜	60.8685	294.832
13½	42.4116	143.139	19½	61.2612	298.648
13⅝	42.8043	145.802	19⅝	61.6539	302.489
13¾	43.197	148.49	19¾	62.0466	306.355
13⅞	43.5897	151.202	19⅞	62.4393	310.245
14	43.9824	153.938	20	62.832	314.16
14⅛	44.3751	156.7	20⅛	63.2247	318.099
14¼	44.7678	159.485	20¼	63.6174	322.063
14⅜	45.1605	162.296	20⅜	64.0101	326.051
14½	45.5532	165.13	20½	64.4028	330.064
14⅝	45.9459	167.99	20⅝	64.7955	334.102
14¾	46.3386	170.874	20¾	65.1882	338.164
14⅞	46.7313	173.782	20⅞	65.5809	342.25

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CIRCUMFERENCES AND AREAS OF CIRCLES
CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
21	65.9736	346.361	27	84.8232	572.557
21⅛	66.3663	350.497	27⅛	85.2159	577.87
21¼	66.759	354.657	27¼	85.6086	583.209
21⅜	67.1517	358.842	27⅜	86.0013	588.571
21½	67.5444	363.051	27½	86.394	593.959
21⅝	67.9379	367.285	27⅝	86.7867	599.371
21¾	68.3298	371.543	27¾	87.1794	604.807
21⅞	68.7225	375.826	27⅞	87.5729	610.268
22	69.1152	380.134	28	87.9648	615.754
22⅛	69.5079	384.466	28⅛	88.3575	621.264
22¼	69.9006	388.822	28¼	88.7502	626.798
22⅜	70.2933	393.203	28⅜	89.1429	632.357
22½	70.686	397.609	28½	89.5356	637.941
22⅝	71.0787	402.038	28⅝	89.9283	643.549
22¾	71.4714	406.494	28¾	90.321	649.182
22⅞	71.8641	410.973	28⅞	90.7137	654.84
23	72.2568	415.477	29	91.1064	660.521
23⅛	72.6495	420.004	29⅛	91.4991	666.228
23¼	73.0422	424.558	29¼	91.8918	671.959
23⅜	73.4349	429.135	29⅜	92.2845	677.714
23½	73.8276	433.737	29½	92.6772	683.494
23⅝	74.2203	438.364	29⅝	93.0699	689.299
23¾	74.613	443.015	29¾	93.4626	695.128
23⅞	75.0057	447.69	29⅞	93.8553	700.982
24	75.3984	452.39	30	94.248	706.86
24⅛	75.7911	457.115	30⅛	94.6407	712.763
24¼	76.1838	461.864	30¼	95.0334	718.69
24⅜	76.5765	466.638	30⅜	95.4261	724.642
24½	76.9692	471.436	30½	95.8188	730.618
24⅝	77.3619	476.259	30⅝	96.2115	736.619
24¾	77.7546	481.107	30¾	96.6042	742.645
24⅞	78.1473	485.979	30⅞	96.9969	748.695
25	78.54	490.875	31	97.3896	754.769
25⅛	78.9327	495.796	31⅛	97.7823	760.869
25¼	79.9254	500.742	31¼	98.175	766.992
25⅜	79.7181	505.712	31⅜	98.5677	773.14
25½	80.1108	510.706	31½	98.9604	779.313
25⅝	80.5035	515.726	31⅝	99.3531	785.51
25¾	80.8962	520.769	31¾	99.7458	791.732
25⅞	81.4889	525.838	31⅞	100.1385	797.979
26	81.6816	530.93	32	100.5312	804.25
26⅛	82.0743	536.048	32⅛	100.9239	810.545
26¼	82.476	541.19	32¼	101.3166	816.865
26⅜	82.8597	546.356	32⅜	101.7093	823.21
26½	83.2524	551.547	32½	102.102	829.579
26⅝	83.6451	556.763	32⅝	102.4947	835.972
26¾	84.0378	562.003	32¾	102.8874	842.391
26⅞	84.4305	567.267	32⅞	103.2801	848.833

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CIRCUMFERENCES AND AREAS OF CIRCLES CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
33	103.673	855.301	39	122.522	1194.593
33⅛	104.065	861.792	39⅛	122.915	1202.263
33¼	104.458	868.309	39¼	123.308	1209.958
33⅜	104.851	874.85	39⅜	123.7	1217.677
33½	105.344	881.415	39½	124.093	1225.42
33⅝	105.636	888.005	39⅝	124.486	1233.188
33¾	106.029	894.62	39¾	124.879	1240.981
33⅞	106.422	901.259	39⅞	125.271	1248.798
34	106.814	907.922	40	125.664	1256.64
34⅛	107.207	914.611	40⅛	126.057	1264.51
34¼	107.6	921.323	40¼	126.449	1272.4
34⅜	107.992	928.061	40⅜	126.842	1280.31
34½	108.385	934.822	40½	127.235	1288.25
34⅝	108.778	941.609	40⅝	127.627	1296.22
34¾	109.171	948.42	40¾	128.02	1304.21
34⅞	109.563	955.255	40⅞	128.413	1312.22
35	109.956	962.115	41	128.806	1320.26
35⅛	110.349	969.	41⅛	129.198	1328.32
35¼	110.741	975.909	41¼	129.591	1336.41
35⅜	111.134	982.842	41⅜	129.984	1344.52
35½	111.527	989.8	41½	130.376	1352.66
35⅝	111.919	996.783	41⅝	130.769	1360.82
35¾	112.312	1003.79	41¾	131.162	1369.
35⅞	112.705	1010.822	41⅞	131.554	1377.21
36	113.098	1017.878	42	131.947	1385.45
36⅛	113.49	1024.96	42⅛	132.34	1393.7
36¼	113.883	1032.065	42¼	132.733	1401.99
36⅜	114.276	1039.195	42⅜	133.125	1410.3
36½	114.668	1046.349	42½	133.518	1418.63
36⅝	115.061	1053.528	42⅝	133.911	1426.99
36¾	115.454	1060.732	42¾	134.303	1435.37
36⅞	115.846	1067.96	42⅞	134.696	1443.77
37	116.239	1075.213	43	135.089	1452.2
37⅛	116.632	1082.49	43⅛	135.481	1460.66
37¼	117.025	1089.792	43¼	135.874	1469.14
37⅜	117.417	1097.118	43⅜	136.267	1477.64
37½	117.81	1104.469	43½	136.66	1486.17
37⅝	118.203	1111.844	43⅝	137.052	1494.73
37¾	118.595	1119.244	43¾	137.445	1503.3
37⅞	118.988	1126.669	43⅞	137.838	1511.91
38	119.381	1134.118	44	138.23	1520.53
38⅛	119.773	1141.591	44⅛	138.623	1529.19
38¼	120.166	1149.089	44¼	139.016	1537.86
38⅜	120.559	1156.612	44⅜	139.408	1546.56
38½	120.952	1164.159	44½	139.801	1555.29
38⅝	121.344	1171.731	44⅝	140.194	1564.04
38¾	121.737	1179.327	44¾	140.587	1572.81
38⅞	122.13	1186.948	44⅞	140.979	1581.61

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CIRCUMFERENCES AND AREAS OF CIRCLES CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
45	141.372	1590.43	48	150.797	1809.56
45 1/8	141.765	1599.28	48 1/8	151.189	1819.
45 1/4	142.157	1608.16	48 1/4	151.582	1828.46
45 3/8	142.55	1617.05	48 3/8	151.975	1837.95
45 1/2	142.943	1625.97	48 1/2	152.368	1847.46
45 5/8	143.335	1634.92	48 5/8	152.76	1856.99
45 3/4	143.728	1643.89	48 3/4	153.153	1866.55
45 7/8	144.121	1652.89	48 7/8	153.546	1876.14
46	144.514	1661.91	49	153.938	1885.75
46 1/8	144.906	1670.95	49 1/8	154.331	1895.38
46 1/4	145.299	1680.02	49 1/4	154.724	1905.04
46 3/8	145.692	1689.11	49 3/8	155.116	1914.72
46 1/2	146.084	1698.23	49 1/2	155.509	1924.43
46 5/8	146.477	1707.37	49 5/8	155.902	1934.16
46 3/4	146.87	1716.54	49 3/4	156.295	1943.91
46 7/8	147.262	1725.73	49 7/8	156.687	1953.69
47	147.655	1734.95	50	157.08	1963.5
47 1/8	148.048	1744.19			
47 1/4	148.441	1753.45			
47 3/8	148.833	1762.74			
47 1/2	149.226	1772.06			
47 5/8	149.619	1781.4			
47 3/4	150.011	1790.76			
47 7/8	150.404	1800.15			

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TABLE FOR CIRCLE BRICK

FOR LENGTH OF CHORD MULTIPLY SINE BY DIAMETER

No. to Circle	Sine of Half Angle	Diameter for 9" Chord	No. to Circle	Sine of Half Angle	Diameter for 9" Chord
5	.58779	15.311"	28	.11196	80.385"
6	.50000	18.000"	29	.10811	83.248"
7	.43386	20.740"	30	.10453	86.099"
8	.38268	23.518"	31	.10044	89.605"
9	.34202	26.314"	32	.09802	91.818"
10	.30902	29.124"	33	.09507	94.667"
11	.28173	31.945"	34	.09225	97.560"
12	.25882	34.773"	35	.08965	100.390"
13	.23932	37.606"	36	.08716	103.257"
14	.22251	40.447"	37	.08481	106.119"
15	.20791	43.287"	38	.08258	108.985"
16	.19509	46.132"	39	.08046	111.856"
17	.18428	48.833"	40	.07846	114.708"
18	.17365	51.828"	41	.07655	117.570"
19	.16459	54.681"	42	.07472	120.449"
20	.15643	57.533"	43	.07300	123.287"
21	.14904	60.386"	44	.07136	127.102"
22	.14230	63.246"	45	.06976	129.014"
23	.13617	66.094"	46	.06825	131.868"
24	.13053	68.949"	47	.06679	134.750"
25	.12534	71.805"	48	.06540	137.614"
26	.12054	74.664"	49	.06407	140.471"
27	.11609	77.526"	50	.06279	143.334"

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DECIMALS OF AN INCH FOR EACH 1-64TH

1-64	.015625	33-64	.515625
1-32	.03125	17-32	.53125
3-64	.046875	35-64	.546875
1-16	.0625	9-16	.5625
5-64	.078125	37-64	.578125
3-32	.09375	19-32	.59375
7-64	.109375	39-64	.609375
1-8	.125	5-8	.625
9-64	.140625	41-64	.640625
5-32	.15625	21-32	.65625
11-64	.171875	43-64	.671875
3-16	.1875	11-16	.6875
13-64	.203125	45-64	.703125
7-32	.21875	23-32	.71875
15-64	.234375	47-64	.734375
1-4	.250	3-4	.75
17-64	.265625	49-64	.765625
9-32	.28125	25-32	.78125
19-64	.296875	51-64	.796875
5-16	.3125	13-16	.8125
21-64	.328125	53-64	.828125
11-32	.34375	27-32	.84375
23-64	.359375	55-64	.859375
3-8	.375	7-8	.875
25-64	.390625	57-64	.890625
13-32	.40625	29-32	.90625
27-64	.421875	59-64	.921875
7-16	.4375	15-16	.9375
29-64	.453125	61-64	.953125
15-32	.46875	31-32	.96875
31-64	.484375	63-64	.984375
1-2	.500	1	.1

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WEIGHT OF VARIOUS MATERIALS

Material	Average Per Cu. Ft. Pounds
BRICK	
Common red	100
Fire clay	150
Silica	128
Chrome	175
Magnesia	160
CEMENT	
Portland	78
Hydraulic	60
CORK	15
COAL AND COKE	
Anthracite	60
Bituminous	49
Charcoal	18.5
Coke	26.3
CONCRETE	
Cement, fine	137
Rubble, coarse	119
EARTH	
Loam, dry, loose	76
Loam, packed	95
Loam, soft, loose mud	108
Loam, dense mud	125
GLASS	
Common window	157
Plate	172
Flint	192
Floor or skylight	158
GRAIN	
Corn	45
Oats	24
Wheat	48
LIME	
Quick, loose lumps	53
Quick, fine	75
Stone, large rocks	168
Stone, irregular lumps	96
MASONRY	
Granite or limestone	165
Mortar, rubble	154
Dry	138
Sandstone, dressed	144
METALS	
Aluminum	166
Brass, cast	524
Bronze	534
Copper, cast	537
Copper, rolled or wire	555
Iron, cast	450
Iron, wrought	482

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WEIGHT OF VARIOUS MATERIALS
CONTINUED

Material	Average Per Cu. Ft. Pounds
METALS—Continued	
Lead, cast	708
Lead, rolled	711
Steel, cast	490
Steel, rolled	495
Tin, cast	459
Zinc, cast	438
OILS	
Engine	55
Crude	48
Petroleum	55
Gasoline	43
ROCK	
Chalk	145
Granite	165
Gypsum	143
Sandstone	144
Pumice stone	57
Quartz	165
Salt, coarse	45
Salt, fine	49
Shales	162
Slate, American	175
SAND	
Dry and loose	100
Dry and packed	110
Wet and packed	130
Gravel packed	118
WATER	
Water as ice	58.7
Water at 32 degrees Fahrenheit	62.4
Water at 212 degrees Fahrenheit	59.6
WOODS, DRY	
Apple	48
Beech	43
Birch	45
Cedar, American	35
Chestnut	41
Ebony	76
Elm	35
Hemlock	25
Hickory	53
Ironwood	114
Mahogany	35 to 53
Maple	49
Oak, live	59
Oak, white	50
Pine, white	25
Pine, yellow northern	34
Pine, yellow southern	45
Spruce	25
Walnut	35

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COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS

Centigrade	Fahrenheit	Centigrade	Fahrenheit	Centigrade	Fahrenheit
1815	3299	1770	3218	1725	3137
1814	3297.2	1769	3216.2	1724	3135.2
1813	3295.4	1768	3214.4	1723	3133.4
1812	3293.6	1767	3212.6	1722	3131.6
1811	3291.8	1766	3210.8	1721	3129.8
1810	3290	1765	3209	1720	3128
1809	3288.2	1764	3207.2	1719	3126.2
1808	3286.4	1763	3205.4	1718	3124.4
1807	3284.6	1762	3203.6	1717	3122.6
1806	3282.8	1761	3201.8	1716	3120.8
1805	3281	1760	3200	1715	3119
1804	3279.2	1759	3198.2	1714	3117.2
1803	3277.4	1758	3196.4	1713	3115.4
1802	3275.6	1757	3194.6	1712	3113.6
1801	3273.8	1756	3192.8	1711	3111.8
1800	3272	1755	3191	1710	3110
1799	3270.2	1754	3189.2	1709	3108.2
1798	3268.4	1753	3187.4	1708	3106.4
1797	3266.6	1752	3185.6	1707	3104.6
1796	3264.8	1751	3183.8	1706	3102.8
1795	3263	1750	3182	1705	3101
1794	3261.2	1749	3180.2	1704	3099.2
1793	3259.4	1748	3178.4	1703	3097.4
1792	3257.6	1747	3176.6	1702	3095.6
1791	3255.8	1746	3174.8	1701	3093.8
1790	3254	1745	3173	1700	3092
1789	3252.2	1744	3171.2	1699	3090.2
1788	3250.4	1743	3169.4	1698	3088.4
1787	3248.6	1742	3167.6	1697	3086.6
1786	3246.8	1741	3165.8	1696	3084.8
1785	3245	1740	3164	1695	3083
1784	3243.2	1739	3162.2	1694	3081.2
1783	3241.4	1738	3160.4	1693	3079.4
1782	3239.6	1737	3158.6	1692	3077.6
1781	3237.8	1736	3156 8	1691	3075.8
1780	3236	1735	3155	1690	3074
1779	3234.2	1734	3153.2	1689	3072.2
1778	3232 4	1733	3151.4	1688	3070.4
1777	3230.6	1732	3149.6	1687	3068.6
1776	3228.8	1731	3147.8	1686	3066.8
1775	3227	1730	3146	1685	3065
1774	3225.2	1729	3144.2	1684	3063.2
1773	3223.4	1728	3142.4	1683	3061.4
1772	3221.6	1727	3140.6	1682	3059.6
1771	3219.8	1726	3138.8	1681	3057.8

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COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS—CONTINUED

Centigrade	Fahrenheit	Centigrade	Fahrenheit	Centigrade	Fahrenheit
1680	3056	1635	2975	1590	2894
1679	3054.2	1634	2973.2	1589	2892.2
1678	3052 4	1633	2971.4	1588	2890.4
1677	3050.6	1632	2969.6	1587	2888.6
1676	3048.8	1631	2967.8	1586	2886.8
1675	3047	1630	2966	1585	2885
1674	3045.2	1629	2964.2	1584	2883.2
1673	3043.4	1628	2962.4	1583	2881.4
1672	3041.6	1627	2960.6	1582	2879.6
1671	3039.8	1626	2958 8	1581	2877.8
1670	3038	1625	2957	1580	2876
1669	3036.2	1624	2955.2	1579	2874.2
1668	3034.4	1623	2953.4	1578	2872.4
1667	3032.6	1622	2951.6	1577	2870.6
1666	3030.8	1621	2949.8	1576	2868.8
1665	3029	1620	2948	1575	2867
1664	3027.2	1619	2946.2	1574	2865.2
1663	3025.4	1618	2944.4	1573	2863.4
1662	3023.6	1617	2942.6	1572	2861.6
1661	3021.8	1616	2940.8	1571	2859.8
1660	3020	1615	2939	1570	2858
1659	3018.2	1614	2937.2	1569	2856.2
1658	3016.4	1613	2935.4	1568	2854.4
1657	3014.6	1612	2933.6	1567	2852.6
1656	3012.8	1611	2931.8	1566	2850.8
1655	3011	1610	2930	1565	2849
1654	3009.2	1609	2928.2	1564	2847.2
1653	3007.4	1608	2926.4	1563	2845.4
1652	3005.6	1607	2924.6	1562	2843.6
1651	3003.8	1606	2922.8	1561	2841.8
1650	3002	1605	2921	1560	2840
1649	3000.2	1604	2919.2	1559	2838.2
1648	2998.4	1603	2917.4	1558	2836.4
1647	2996.6	1602	2915.6	1557	2834.6
1646	2994.8	1601	2913.8	1556	2832.8
1645	2993	1600	2912	1555	2831
1644	2991.2	1599	2910.2	1554	2829.2
1643	2989.4	1598	2908.4	1553	2827.4
1642	2987.6	1597	2906.6	1552	2825.6
1641	2985.8	1596	2904.8	1551	2823.8
1640	2984	1595	2903	1550	2822
1639	2982.2	1594	2901.2	1549	2820.2
1638	2980.4	1593	2899.4	1548	2818.4
1637	2978.6	1592	2897.6	1547	2816.6
1636	2976.8	1591	2895.8	1546	2814.8

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COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS—CONTINUED

Centi-grade	Fahren-heit	Centi-grade	Fahren-heit	Centi-grade	Fahren-heit
1545	2813	1500	2732	1455	2651
1544	2811.2	1499	2730.2	1454	2649.2
1543	2809.4	1498	2728.4	1453	2647.4
1542	2807.6	1497	2726.6	1452	2645.6
1541	2805.8	1496	2724.8	1451	2643.8
1540	2804	1495	2723	1450	2642
1539	2802.2	1494	2721.2	1449	2640.2
1538	2800.4	1493	2719.4	1448	2638.4
1537	2798.6	1492	2717.6	1447	2636.6
1536	2796.8	1491	2715.8	1446	2634.8
1535	2795	1490	2714	1445	2633
1534	2793.2	1489	2712.2	1444	2631.2
1533	2791.4	1488	2710.4	1443	2629.4
1532	2789.6	1487	2708.6	1442	2627.6
1531	2787.8	1486	2706.8	1441	2625.8
1530	2785	1485	2705	1440	2624
1529	2784.2	1484	2703.2	1439	2622.2
1528	2782.4	1483	2701.4	1438	2620.4
1527	2780.6	1482	2699.6	1437	2618.6
1526	2778.8	1481	2697.8	1436	2616.8
1525	2777	1480	2696	1435	2615
1524	2775.2	1479	2694.2	1434	2613.2
1523	2773.4	1478	2692.4	1433	2611.4
1522	2771.6	1477	2690.6	1432	2609.6
1521	2769.8	1476	2688.8	1431	2607.8
1520	2768	1475	2687	1430	2606
1519	2766.2	1474	2685.2	1429	2604.2
1518	2764.4	1473	2683.4	1428	2602.4
1517	2762.6	1472	2681.6	1427	2600.6
1516	2760.8	1471	2679.8	1426	2598.8
1515	2759	1470	2678	1425	2597
1514	2757.2	1469	2676.2	1424	2595.2
1513	2755.4	1468	2674.4	1423	2593.4
1512	2753.6	1467	2672.6	1422	2591.6
1511	2751.8	1466	2670.8	1421	2589.8
1510	2750	1465	2669	1420	2588
1509	2748.2	1464	2667.2	1419	2586.2
1508	2746.4	1463	2665.4	1418	2584.4
1507	2744.6	1462	2663.6	1417	2582.6
1506	2742.8	1461	2661.8	1416	2580.8
1505	2741	1460	2660	1415	2579
1504	2739.2	1459	2658.2	1414	2577.2
1503	2737.4	1458	2656.4	1413	2575.4
1502	2735.6	1457	2654.6	1412	2573.6
1501	2733.8	1456	2652.8	1411	2571.8

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COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS—CONTINUED

Centi-grade	Fahren-heit	Centi-grade	Fahren-heit	Centi-grade	Fahren-heit
1410	2570	1320	2408	870	1598
1409	2568.2	1310	2390	860	1580
1408	2566.4	1300	2372	850	1562
1407	2564.6	1290	2354	840	1544
1406	2562.8	1280	2336	830	1526
1405	2561	1270	2318	820	1508
1404	2559.2	1260	2300	810	1490
1403	2557.4	1250	2282	800	1472
1402	2555.6	1240	2264	790	1454
1401	2553.8	1230	2246	780	1436
1400	2552	1220	2228	770	1418
1399	2550.2	1210	2210	760	1400
1398	2548.4	1200	2192	750	1382
1397	2546.6	1190	2174	740	1364
1396	2544.8	1180	2156	730	1346
1395	2543	1170	2138	720	1328
1394	2541.2	1160	2120	710	1310
1393	2539.4	1150	2102	700	1292
1392	2537.6	1140	2084	690	1274
1391	2535.8	1130	2066	680	1256
1390	2534	1120	2048	670	1238
1389	2532.2	1110	2030	660	1220
1388	2530.4	1100	2012	650	1202
1387	2528.6	1090	1994	640	1184
1386	2526.8	1080	1976	630	1166
1385	2525	1070	1958	620	1148
1384	2523.2	1060	1940	610	1130
1383	2521.4	1050	1922	600	1112
1382	2519.6	1040	1904	590	1094
1381	2517.8	1030	1886	580	1076
1380	2516	1020	1868	570	1058
1379	2514.2	1010	1850	560	1040
1378	2512.4	1000	1832	550	1022
1377	2510.6	990	1814	540	1004
1376	2508.8	980	1796	530	986
1375	2507	970	1778	520	968
1374	2505.2	960	1760	510	950
1373	2503.4	950	1742	500	932
1372	2501.6	940	1724	490	914
1371	2499.8	930	1706	480	896
1370	2498	920	1688	470	878
1360	2480	910	1670	460	860
1350	2462	900	1652	450	842
1340	2444	890	1634	440	824
1330	2426	880	1616	430	806

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COMPARISON OF CENTIGRADE AND FAHRENHEIT THERMOMETERS—CONTINUED

Centigrade	Fahrenheit	Centigrade	Fahrenheit	Centigrade	Fahrenheit
420	788	220	428	20	68
410	770	210	410	10	50
400	752	200	392	0	32
390	734	190	374	1	30.2
380	716	180	356	2	28.4
370	698	170	338	3	26.6
360	680	160	320	4	24.8
350	662	150	302	5	23
340	644	140	284	6	21.2
330	626	130	266	7	19.4
320	608	120	248	8	17.6
310	590	110	230	9	15.8
300	572	100	212	10	14
290	554	90	194	11	12.2
280	536	80	176	12	10.4
270	518	70	158	13	8.6
260	500	60	140	14	6.8
250	482	50	122	15	5
240	464	40	104	16	3.2
230	446	30	86	17	1.4
				18	0.4

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